PB90-167511

# Final-Generic Environmental Impact Statement for Wastewater Management in Rural Lake Areas

Illinois State Environmental Protection Agency, Springfield

Prepared for:

Environmental Protection Agency, Chicago, IL

Jan 83

U.S. Department of Commerce
National Technical Information Service
NTIS

FL 1846

## TECHNICAL REPORT DATA

*(Please read Instructions on the reverse before completing)*

1. REPORT NO.

2.

3. RECIPIENT'S ACCESSION NO. PB 90 167511/AS

4. TITLE AND SUBTITLE
Final-Generic Environmental Impact Statement for Wastewater Management In Rural Lake Areas

5. REPORT DATE January, 1983

6. PERFORMING ORGANIZATION CODE

7. AUTHOR(S)
US EPA - Region V

8. PERFORMING ORGANIZATION REPORT NO.

9. PERFORMING ORGANIZATION NAME AND ADDRESS
Illinois EPA
Springfield, IL 62706

10. PROGRAM ELEMENT NO.

11. ~~CONTRACT~~/GRANT NO.

12. SPONSORING AGENCY NAME AND ADDRESS
US EPA - Region V
230 S. Dearborn
Chicago, IL 60604

13. TYPE OF REPORT AND PERIOD COVERED FINAL

14. SPONSORING AGENCY CODE EPACLP

15. SUPPLEMENTARY NOTES

16. ABSTRACT

The environmental impact statement examines the environmental, economic, social costs within Region V of rural lake wastewater planning. Uses 7 projects to demonstrate managing on-site and small-scale alternatives to conventional wastewater treatment. ~~Manual for planning.~~ This → Also can be used as a manual for planning and constructing rural lake projects.

17. KEY WORDS AND DOCUMENT ANALYSIS

| a. DESCRIPTORS | b. IDENTIFIERS/OPEN ENDED TERMS | c. COSATI Field/Group |
|---|---|---|
| | | |

18. DISTRIBUTION STATEMENT
Unlimited release

19. SECURITY CLASS (This Report)

20. SECURITY CLASS (This page)

21. NO. OF PAGES

22. PRICE

EPA Form 2220-1 (Rev. 4-77) PREVIOUS EDITION IS OBSOLETE

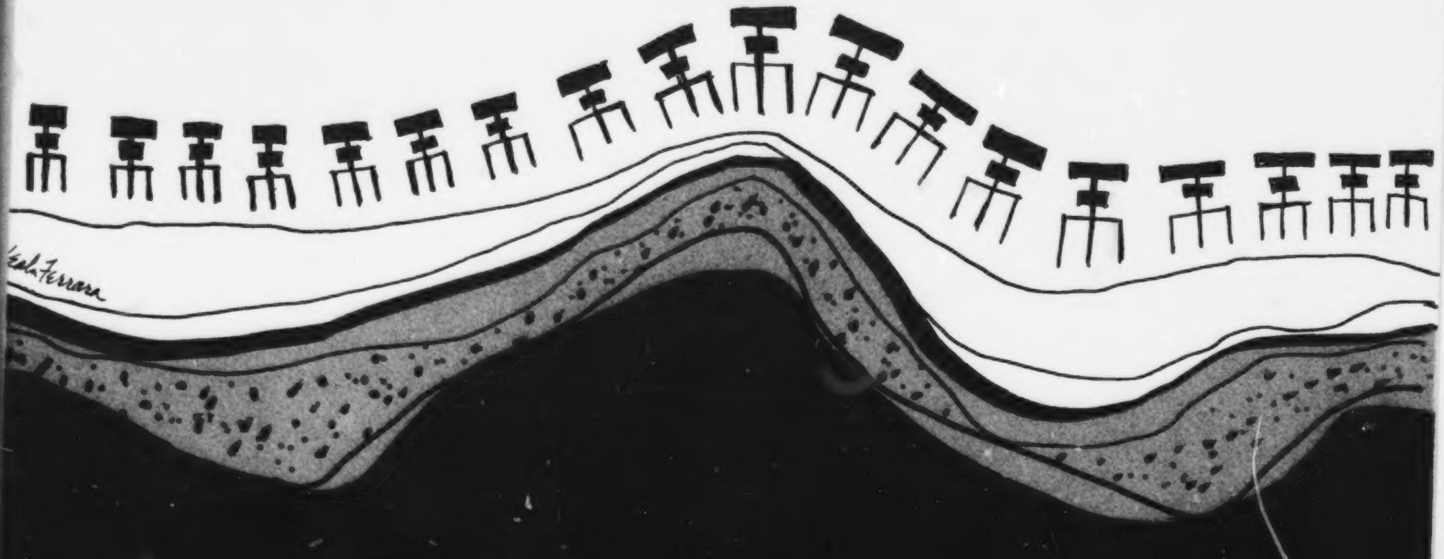
EPA
United States
Environmental Protection
Agency

Region V

Water Division
230 South Dearborn Street
Chicago, Illinois 60604

JANUARY 1983

PB90-167511



Final-Generic

# WASTEWATER MANAGEMENT IN RURAL LAKE AREAS

REPRODUCED BY
U.S. DEPARTMENT OF COMMERCE
NATIONAL TECHNICAL INFORMATION SERVICE
SPRINGFIELD, VA. 22161

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
REGION V
230 SOUTH DEARBORN ST.
CHICAGO, ILLINOIS 60604

REPLY TO ATTENTION OF:
5WFI

TO ALL INTERESTED AGENCIES, PUBLIC GROUPS AND CITIZENS:

The Final Generic Environmental Impact Statement (EIS) for Wastewater Management in Rural Lake Areas is provided for your information and review. This EIS has been prepared in compliance with the National Environmental Policy Act of 1969, and the subsequent regulations prepared by the Council on Environmental Quality and this Agency.

Upon publication of a notice in the Federal Register, a 30-day period will commence during which this Agency will not take any administrative actions. After 30 days, EPA may take certain administrative actions in accordance with this Final EIS.

Sincerely yours,

alan Levin (Acting)

Valdas V. Adamkus
Regional Administrator

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
REGION V
230 SOUTH DEARBORN ST.
CHICAGO, ILLINOIS 60604

REPLY TO ATTENTION OF:
5WFI

Dear Reader:

This Region is completing a five-year effort to develop methods and to analyze issues involved in wastewater management for unsewered communities. This Final Generic EIS is one of the principal products of our efforts. We feel that this document reflects the state-of-the-art of rural wastewater management.

The strength of our results derives in large part from the comments and suggestions made by citizens and officials in the seven case study communities, and by interested State and Federal officials. An EIS, however, only makes recommendations. It is people at all levels of government, in many private companies, and in numerous small communities that put these recommendations to work.

Therefore, we are seeking your comments and suggestions on a number of the EIS recommendations so that we will know which ones are likely to be put to work, and which ones should be emphasized in our management of the Construction Grants program.

If you read the EIS, please complete the survey and return it to us at the address printed on the last page. Attach any other written comments that you may have in the spaces on the survey form itself.

If enough surveys are returned (10% or more), we will prepare a brief report summarizing the results. To receive a copy of the report, check off the space at the top of the next page.

Thank you for your interest in wastewater management and clean water.

Sincerely yours,

Gene Wojcik

Gene Wojcik
Chief, Unit I
Environmental Impact Section

## Final Generic EIS for Wastewater Management in Rural Lake Areas

January 1983

### READER OPINION SURVEY

Name:

Address:

☐ I would like a copy of the Survey Summary

Job Title:

Type of Employer (check any that are applicable) :

☐ Local government
☐ State government
☐ Federal government
☐ Private organization
☐ Self-employeed
☐ Other: ______________

☐ Environmental protection
☐ Public works
☐ Public health
☐ Other government
☐ Equipment supplier or manufacturer
☐ Building construction
☐ Other: ______________

☐ On-site system construction
☐ Septic tank service
☐ Other wastewater - construction
☐ Other wastewater - operation
☐ Consulting
☐ A/E firm
☐ Public interest group

I ☐ do ☐ do not have a decision-making role in wastewater management for ☐ one or ☐ more communities.

I ☐ do ☐ do not have a staff or advisory role in wastewater management for ☐ one or ☐ more communities.

If you are a sanitarian, public health officer, an elected official, or are otherwise responsible for public health or water quality, do you know the numbers and types of on-site system failures in the places you are responsible for?

☐ Yes
☐ No
☐ No, there are no on-site systems in my area
☐ No, I don't deal with on-site systems.

If you are not responsible for public health or water quality, do you think the persons who are responsible in your community know the numbers and types of failures?

☐ Yes,they do
☐ No, they don't
☐ Maybe, but the only existing on-site systems they have time to inspect are the ones they get complaints about.
☐ I don't care
☐ My community is sewered

Comment:

A principle theme of the Generic EIS for Wastewater Management in Rural Lake Areas is the benefits of increased community roles in monitoring and maintaining on-site systems. Do you have opinions about the types of agencies best suited to define and implement those roles:

☐ Health officer or health department
☐ Public works department
☐ Private firms under contract to county or local government
☐ Special purpose district
☐ Expanded role for existing sanitary or water and sewer district
☐ Depends on local preferences, state requirements, politics, etc.
☐ Other: ____________________

Comment:

There are several ways that communities can improve the maintenance that is provided for on-site and small-scale wastewater facilities. Which would you prefer?

☐ Renewable permits requiring verification that an approved contractor inspected and serviced the system
☐ Maintenance and inspection services provided by management agency personnel
☐ Maintenance and inspection services provided by contractors to a management agency
☐ Public education
☐ Depends on how much liability a management agency assumes for fixing future failures
☐ Other: ________________________________

Local officials and other community leaders have a variety of reasons for wanting improved wastewater facilities. Rate the following reasons for their effect in motivating action in unsewered communities with which you are familiar:

( 0 = I really don't have a feeling for this.

1 = Relevant only in applications for grants and loans.
2 = Useful at public meetings and with the Citizens Advisory Committee.
3 = A responsibility of municipal and county governments requiring continued study.
4 = Might get a project through a referendum.
5 = Hot enough to get re-elected with. )

| Circle one | Reasons | Comments |
|---|---|---|
| 0 1 2 3 4 5 | Protecting the public health | |
| 0 1 2 3 4 5 | Improving property values | |
| 0 1 2 3 4 5 | Facilitating industrial development | |
| 0 1 2 3 4 5 | Avoiding prosecution | |
| 0 1 2 3 4 5 | Protecting lakes and streams for recreational use | |
| 0 1 2 3 4 5 | Facilitating residential development | |
| 0 1 2 3 4 5 | Facilitating commercial development | |
| 0 1 2 3 4 5 | Abating odor and visual nuisances | |
| 0 1 2 3 4 5 | Protecting groundwater quality | |
| 0 1 2 3 4 5 | Protecting drinking water supplies | |
| 0 1 2 3 4 5 | Allowing present residents to add water using appliances or house extensions | |
| 0 1 2 3 4 5 | Other: ____________________ | |
| 0 1 2 3 4 5 | Other: ____________________ | |

New on-site and small-scale technologies can overcome some of the natural constraints to standard septic tank systems. But they generally require more maintenance and should be inspected more frequently. Would you support establishment of management agencies that provide inspection and maintenance services for the purpose of facilitating development on property not suited for standard septic tank systems? (Please note that the Generic EIS makes no recommendation on this issue.)

☐ Yes
☐ No
☐ Only where it is technically feasible to sewer if the technologies don't work

Comment:

A number of concepts are presented in the Generic EIS for Wastewater Management in Rural Lake Areas that would have utility in any unsewered community. Based on your knowledge of small communities and sanitation without sewers, how useful do you expect the following concepts to be in planning or managing an optimum operation alternative:

( 0 = I have no feeling for it, or I didn't understand the EIS
1 = Destined for oblivion
2 = Appropriate only in special cases
3 = Usefulness depends on characteristics of each community
4 = Has merit, but I'd like to see someone try it out first
5 = Ought to be considered in any plan or management program. )

| Circle One | | Final EIS Page Ref. | Comments |
|---|---|---|---|
| 0 1 2 3 4 5 | Decision Flow Diagram for existing on-site systems | 31 | |
| 0 1 2 3 4 5 | Use of performance data to decide what to do with existing on-site systems | 28-29 | |
| 0 1 2 3 4 5 | Sequencing data collection and alternative development tasks | 54-58 | |
| 0 1 2 3 4 5 | Early identification of Small Waste Flows districts using results of the Cost Variability Study | 66 | |
| 0 1 2 3 4 5 | Use of Average Annual Homeowner Cost to compare local economic impacts of alternatives | 68-69 | |
| 0 1 2 3 4 5 | Matching management agency responsibilities to failure rate, housing density, and sensitivity of water resources | 76-79 | |
| 0 1 2 3 4 5 | Management agency liability for fixing system failures | 80-81 | |
| 0 1 2 3 4 5 | Public ownership of on-site systems | 80-81 | |
| 0 1 2 3 4 5 | Sanitary Review Board input to management agency decisions | 83-84 | |
| 0 1 2 3 4 5 | Construction variances for non-conforming upgrades | 84-85 | |
| 0 1 2 3 4 5 | Usage variances for continued use of non-conforming systems | 84-85 | |
| 0 1 2 3 4 5 | Reserve fund to pay for future repairs and upgrades | 92 | |
| 0 1 2 3 4 5 | Concurrent land use and wastewater facilities planning | 109-112 | |
| 0 1 2 3 4 5 | Environmental Constraints Evaluation | 109-110 | |

| | | |
|---|---|---|
| 0 1 2 3 4 5 | Nomograph for identifying lakes that are sensitive to nutrients from on-site systems | 114-117 |
| 0 1 2 3 4 5 | Simplified easement form | 130-131 |

Many communities that implement an optimum operation program for on-site systems will have a few properties where holding tanks or some other expensive facilities are required. Would you

- ☐ require those residents to pay the full cost of operating and maintaining their facilities?
- ☐ subsidize part of the cost out of user charges or general government funds?
- ☐ have everyone pay the same user charge regardless of the cost for any one type of system?
- ☐ There's no way residents in my community would ever pay a user charge for their own on-site system.

Comment:

There are a number of things that regional, state or Federal agencies could do to help communities achieve the economic and other advantages of Small Waste Flows management. In light of budget restrictions and the problems in getting new efforts staffed and funded, how would you rate the following initiatives:

( 0 = I don't understand what this initiative involves
1 = No socially redeeming value
2 = Sounds useful, but later
3 = The staff likes it, but they are hesitant to propose it to the head of the agency
4 = This should have been done already

5 = I don't care how many have been laid off or what the rest are doing. Get this done. )

| Circle one | | Final EIS Page Ref. | Comments |
|---|---|---|---|
| 0 1 2 3 4 5 | Development of a standardized information system for use in both local record keeping and regional or state correlations of on-site system performance with soil, use, site, design, age, and maintenance characteristics | 53-54 | |
| 0 1 2 3 4 5 | Request the US Department of Labor to change the classification of small waste flows projects from heavy construction to commercial or residential | 127-128 | |

| | | |
|---|---|---|
| 0 1 2 3 4 5 | Comprehensive evaluations of state roles in the management of existing and future on-site systems | 132 |
| 0 1 2 3 4 5 | Amendment of state regulations for on-site systems that outlines a process for deciding to abandon, upgrade, or continue using "as is" existing on-site systems | 132 |
| 0 1 2 3 4 5 | State legislation giving local governments explicit authority to manage on-site systems throughout their life cycle | 132 |
| 0 1 2 3 4 5 | Analysis of state laws regarding rights of access for management agencies to enter private property | 132 |
| 0 1 2 3 4 5 | Coordination of pilot Small Waste Flows projects in several different settings to test innovative technologies and management methods | 132 |
| 0 1 2 3 4 5 | Municipal Needs Analysis for small communities not participating in the US EPA Construction Grants program | 133 |
| 0 1 2 3 4 5 | Separate state Construction Grants priority lists for small communities | 133 |
| 0 1 2 3 4 5 | State or regional management and technical assistance for small communities in planning, designing, or implementing projects | 133-135 |
| 0 1 2 3 4 5 | Training programs for small system specialists | 136-137 |
| 0 1 2 3 4 5 | Homeowner education programs and materials | 137 |
| 0 1 2 3 4 5 | Listings of approved small system specialists such as installation contractors, soil testers, designers survey specialists, inspectors, management planners, etc. | |
| 0 1 2 3 4 5 | Analysis of toxic substances and viruses in wells of selected communities and correlation with septic waste disposal | 144 |

Thank you for your response.

Please fold forms in three sections, staple, and mail to the address printed on the back of the last page.

Staple here

Fold

From:

Place
Stamp
Here

Jack Kratzmeyer
U.S. Environmental Protection Agency
Municipal Facilities Branch
Environmental Impact Section (5WFI)
230 South Dearborn Street
Chicago, Illinois 60604

Fold

# FINAL
# GENERIC ENVIRONMENTAL IMPACT STATEMENT
# for
# WASTEWATER MANAGEMENT IN RURAL LAKE AREAS

Prepared by the
United States Environmental Protection Agency
Region V, Chicago, Illinois

and

WAPORA, Incorporated

January, 1983

Approved by:

Alan Levin (Acting)
Valdas V. Adamkus
Regional Administrator

# FINAL ENVIRONMENTAL IMPACT STATEMENT

# WASTEWATER MANAGEMENT IN RURAL LAKE AREAS

Prepared by

U.S. Environmental Protection Agency, Region V

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## Abstract

This EIS examines the environmental, economic and social costs within Region V of rural lake wastewater planning especially as funded and managed under the Clean Water Act. It reviews and analyzes facilities planning and environmental review methods for rural lake areas.

It uses seven sample projects of this type to present specific recommendations about development and management of on-site and small scale alternatives to conventional wastewater treatment. It recommends specific methods to document project need and water quality impact. It concludes that wherever continued operation of a substantial percentage of existing systems is feasible, a wastewater management program based on optimum operation of existing systems will result in substantial savings in capital and present worth costs.

The EIS offers a complete manual for planning, construction and management of decentralized rural lake projects with or without Federal or State assistance. It can be used, and contains specific advice for projects operating under both old (1977) and new (1981) Construction Grant Amendments. Reasonable use of the methods outlined here for construction grant applications already in hand will result in an estimated savings exceeding $460 million in Region V alone.

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### Cross-References

Throughout this document cross-reference notes are printed in the margins. These notes refer either to related sections within the document (e.g., EIS I-C-2) or to sections of the separately published Technical Reference Document (e.g., TRD II-A). The Table of Contents for the Technical Reference Document is reproduced in Appendix E.

The issues and the format of this Final EIS are substantially the same as the Draft EIS. Changes have been made to reflect new law, regulations, and guidance for the Construction Grants Program. These changes are identified by a cross-reference to relevant sections of the Clean Water Act (e.g., 201 (1)(2)), new Construction Grants regulations (e.g., 40 CFR 35.2110), or Construction Grants - 1982, the new program guidance document (e.g., 6.2). Changes have also been made in response to comments on the Draft EIS and to incorporate improved discussions of the topics. Cross-references to comments on the Draft EIS, whether a change was made or not, appear in the margins (e.g., C.26). All changes from the Draft except editorial and typographical are identified by underlining.

Legend for Cross-References in Margins

| | |
|---|---|
| EIS I-C-2 | Section of this EIS |
| TRD II-A | Section of the Technical Reference Document published separately |
| CWA 201(g)(1) | Section of the Clean Water Act which necessitates change in the text |
| 40 CFR 35.2110 | Section of the Construction Grants regulations which necessitates change in the text |
| CG 82-6.2. | Section of the program guidance document, Construction Grants - 1982, upon which change was based. |
| C.26. | Comment on the Draft EIS relevant to topic discussed (see Chapter VII) |

# FINAL EIS

The Draft Environmental Impact Statement for Wastewater Management in Rural Lake Areas (Draft EIS) was distributed to the public and to concerned agencies in September, 1981. In December 1981, shortly after the end of the comment period for the Draft EIS, Congress passed Public Law 97-117 amending the Clean Water Act. Also, the U.S. Environmental Protection Agency has revised the regulations covering the Construction Grants program and has consolidated applicable guidance documents. Completion of the Final EIS was deferred until the regulations and guidance were available in interim final and draft form, respectively.

The following changes in the law, in the regulations, and in program guidance have had significant effects on what is presented in this Environmental Impact Statement:

## Municipal Wastewater Treatment Construction Grant Amendments of 1981, Public Law 97-117, enacted December 29, 1981

- After December 29, 1981, no grants will be made solely for facilities planning (Step 1) or for design (Step 2). However, Grants for building (Step 3) shall include an allowance for facilities planning and design based on a percentage of total project cost.
- States shall reserve a portion of their annual allotment to advance allowance funds to small communities which would not otherwise be financially able to complete an application.
- Increased funding for alternative and innovative technologies is continued through fiscal year 1985.
- Field testing of alternative and innovative processes or techniques are grant eligible costs.
- Grant applicants are encouraged to develop capital financing plans.
- After October 1, 1984, grants will not be made for collector sewers except that the Governor of a state may elect to use up to 20 percent of a state's allotment to fund facilities which were previously ineligible, such as collector sewers.

## 40 CFR Part 35, Grants for Construction of Treatment Works

- A new Subpart I is added in which only items required by statute and minimum requirements for effective program management are included.
- Emphasizes that the need for proposed facilities will be investigated during facilities planning.
- Requires consideration of on-site systems in unsewered communities of 10,000 or less.
- Requires analysis of cost impacts of selected alternatives on users.
- Subpart E regulations remain in effect for grants approved before May 12, 1982.

## Construction Grants - 1982

- Guidance for all three steps for the Construction Grants Program is consolidated in this new document.

- This document and its predecessor, Facilities Planning 1981, cancel and replace documents (PRM's and POM's) which had the effect of Agency policy. However, guidance offered in Construction Grants - 1982 and not duplicated in Subpart I of the regulations is considered now to be suggestions of good practice, not requirements.

Because of these changes, significant elements of the Draft EIS needed to be reconsidered and revised, especially needs documentation policy, funding of field work, and the level of detail required for describing facilities plan proposed actions. See notes at the end of the Table of Contents explaining how these and other changes from the Draft EIS are identified. Since grants approved before May 12, 1982, are still subject to pre-existing regulations and guidance, parts of the Draft EIS which are deleted or significantly revised are repeated in Appendix F for ready reference.

# EXECUTIVE SUMMARY

## What This EIS Does and Why (Purpose of and Need for Action)

This EIS examines a number of Federal actions, especially U.S. EPA review and approval of facilities plans in unsewered rural lake communities or parts of them.

Seven earlier EIS's on rural lake sewering projects, comprising 35 lakes in five states, were the case studies for this EIS. They provided the identification of issues and much of the analysis and data used here. The two major findings of these EIS's are:

- that wastewater management based on optimum operation of existing on-site systems differs substantially from either new centralized facilities or new small waste flows facilities, and
- that wastewater management based on existing systems allows substantial savings in capital costs and operation and maintenance expenses, compared with centralized facilities. This occurs wherever continued operation of a substantial percentage of systems is feasible, while still meeting water quality objectives.

The six projects recommended for implementation in the EIS's offered present worth savings of approximately $44 million or $5,220 per dwelling unit compared to conventional sewering. If this savings can be achieved for just the 80,000 additional unsewered dwellings in lake communities, the total regional present worth savings for lake projects funded through 1985 could be as high as $460 million.

Savings from this recommended wastewater management approach, if applied to that percentage of dwellings in the Region that might otherwise be sewered, are estimated to be $1.9 billion or $4,436 per dwelling. These 430 thousand dwellings represent 13% of the 3.3 million dwellings in the Region now served by on-site systems.

Within Region V there are 1,121 applications for Construction Grants funds on file from communities under 10,000 population. Of these communities an estimated 372 include developed lakeshores. Based on past funding experience, most of these communities will apply for new collector sewers to serve areas now using on-site systems.

To realize the cost savings of optimum operation alternatives while achieving water quality goals requires adequate data on the performance of existing on-site systems. This performance data is almost always lacking. Surveys conducted indicate a much lower failure rate than would be predicted from site limitations. Large sums may be spent needlessly if valid performance data are lacking, or if site suitability is wrongly evaluted. This demands the collection and objective analysis of performance data and corollary information such as on-site system design, usage, maintenance, soils, site constraints, groundwater hydrology, and surface drainage.

Partly due to the lack of data, on-site systems are blamed for problems they have not, in fact, caused. On-site wells are more often contaminated by surface water entering them because of poor construction than by gross contamination of the aquifer by on-site wastewater systems. Eutrophication of lakes is also blamed on on-site systems yet precipitation and non-point sources almost always are far larger sources of limiting nutrients.

This does not mean that on-site systems cause no problems. Indeed, though the flows are small and the adverse impacts are limited in scale and severity, the significance of on-site malfunctions is amplified by the very factor that makes them inexpensive--their proximity to dwellings. Real water quality and public health problems with on-site systems need to be revealed and remedied.

A major factor in the failure of on-site systems is lack of adequate maintenance. Many owners simply neglect the routine preventive measures required by their systems. Few install or even know about the simple flow reduction devices that could prolong the life of their systems. When their systems fail, owners are severely limited in the types of repair, upgrading, or replacement measures they may take. Off-site alternatives are either too expensive or not implementable by the individual owners.

Public involvement and leadership could resolve many of these problems. Yet only a limited tradition of public management for private on-site systems exists beyond initial permitting and inspection of construction.

In response to the opportunties and the obstacles associated with the optimum operation of existing on-site systems, this EIS proposes and examines the following actions for implementation by Region V and state Construction Grants agencies.

1. Encourage community supervision of small waste flows facilities.
2. Develop evaluation methods for optimum operation of existing on-site systems.
3. Promote collection and analysis of on-site and small-scale system performance data.
4. Review eligibility regulations.
5. Encourage states to play active roles in rural wastewater management.
6. Recommend facilities planning and impact analysis methodologies.
7. Encourage grantee evaluation and adoption of mitigating measures.
8. Encourage public participation.
9. Encourage grantees' innovation with small waste flows technologies and community management.

## Small Waste Flows Technologies

About 3.3 million on-site systems serve 22% of the population in Region V. 95% of these are septic tank/soil absorption systems or cesspools.

Inadequancies and failures of on-site systems that warrant public funding for abatement include:

- direct discharges,
- surface malfunctions,
- backups into the household, and
- groundwater contamination at a point of use.

The significance of these failures is discussed.

Groundwater contamination is the failure with the greatest possibility for adverse impacts on public health. Reported failure rates seldom include groundwater failures. Generally, original sampling is the only means of quantifying groundwater failures.

Reported failure rates seldom specify type. Also, reports cannot usually be compared or combined; data collection, interpretation and reporting methods typically are unique to each survey.

The factors that contribute to failures can be controlled to varying degrees. Most amenable to control are usage and maintenance of the system and surface drainage. Other factors such as system design, soil characteristics, and groundwater hydrology can be controlled by upgrading or replacing the on-site facilities. Some factors can only be overcome by transporting wastes off-site.

Many options exist for preventing and correcting failures of on-site systems. Some, listed in the text, are described more fully in the fact sheets of the accompanying Technical Reference Document.

Field studies of on-site system performance in the Seven Rural Lake EIS's showed total failure rates (including groundwater failures in several cases) significantly lower than indicated by the percent of systems not complying with current design codes. The successful performance of many subcode systems suggests that code conformance is not the best criteria for deciding the fate of existing on-site systems. The intent of design codes is to prevent water quality and public health problems. If that is being done by subcode systems, then upgrading, replacing, or abandoning the systems is unjustified.

Similarly, soil type and conventional criteria for soil limitation ratings (slight, moderate, and severe limitations) are not suitable criteria for deciding the fate of existing systems. Empirical data relating soil characteristics to system performance at the local level can be readily obtained during sanitary surveys and are an integral element of optimum operation alternatives.

The text contains a decision flow diagram of a recommended sequential approach to selecting appropriate technologies for individual existing systems. The sequence is divided into five steps including 1) available data review and community surveys, 2) on-site sanitary inspection, 3) identification of problem, 4) detailed site analysis, and 5) technology selection.

Any community will have some developed properties where sewering is not economically feasible, and upgrading or replacement of the existing soil absorption system alone may not solve failures or prevent future failures. In such cases, consideration should be given to use of one or more of the following technologies:

- flow reduction,
- water metering,
- segregation of waste streams,
- reuse/recycle,
- holding tanks, or
- effluent plume recovery.

Where local conditions make on-site options infeasible or non-cost-effective, small scale off-site collection and treatment technologies may solve existing problems. Collection methods include conventional gravity, small-diameter gravity, pressure, and vacuum sewers. In lake watersheds where effluent discharges are discouraged, preferred small scale treatment technologies are subsurface land application (large drainfields called cluster systems) and surface land application by irrigation or infiltration - percolation. Where discharges to surface water are acceptable, treatment options expand to include use of recirculating sand filters with surface discharge, land application by overland flow, wetlands discharge, lagoons, fixed film treatment plants and activated sludge treatment plants.

All optimum operation alternatives will also include off-site treatment and disposal of septage and, where generated, holding tank wastes. General options include land application (may be limited to stabilized septage), treatment in a wastewater plant and treatment in a separate septage plant.

Aside from selecting appropriate on-site technologies, performance data are also required to determine the eligibility of collector sewers. The role of performance data, cost-effectiveness, and "substantial human habitation" in eligibility determinations for collector sewers is illustrated in a decision flow diagram in the text. The decision flow diagram is based on national policy contained in Construction Grants 1982.

Region V's guidance on performance data collection (needs documentation) is based on national policy, experience gained during preparation of the Seven Rural Lake EIS's, and input from states in the Region. The current guidance is Appendix A of this EIS. This guidance integrates needs documentation activities with the development, costing, selection, and design of alternatives. Also, decision points are identified at which the results of needs documentation work can be reviewed, and the scope of facilities planning revised appropriately. A process diagram shows the interaction of these two vital activities.

The EIS describes new methods of needs documentation used in the preparation of the Seven Rural Lake EIS's, some for the first time in Construction Grants programs. It explains limits to their utility and discusses eligibility considerations. The needs documentation methods include:

- interviews with local officials and contractors,
- windshield surveys,
- review of soil maps,
- preparation of base maps,
- aerial photographic interpretation,
- septic leachate detection,
- mailed questionnaires,
- partial sanitary surveys, and
- representative sampling of soil and groundwater.

Collection of this data and later detailed site analysis generates previously unavailable information on system performance and on factors affecting performance. Future utility of this information will depend on standardizing data collection and reporting methods, and providing efficient means of storage and retrieval. This EIS recommends that Region V, Headquarters, the Office of Research and Development, and other divisions of U.S. EPA discuss among themselves and with concerned state agencies ways to accomplish this.

Coordination of needs documentation work with the development and cost analysis of optimum operation alternatives is critical to the time and cost efficiency of facilities planning for unsewered areas. Three stages of alternative development are described. The first is based on technology assumptions. Available data and information from community surveys are used to estimate the percentage of on-site systems requiring upgrading, replacement, or abandonment. Assumptions for the technologies required are then made and costs are estimated for comparison with sewered alternatives. Depending on the quality of available data, this first stage of needs documentation and alternative development may demonstrate which areas require sewers, which require on-site upgrading, replacement or renovation, and which require no action.

If the first stage is inconclusive or the data base does not adequately quantify or identify the causes of on-site system failures, then a second stage of needs documentation and alternative development may be necessary. Partial sanitary surveys and representative sampling of soil and groundwater provide the basis for more conclusive analysis of failures and feasible remedies. A major difference in needs documentation work between the first stage and the second is that private property will have to be entered to acquire the second stage data.

For parts of communities shown to benefit from optimum operation of on-site systems, data from either stage one or both stages will usually suffice to describe proposed facilities for a facilities plan. Subject to state requirements for greater detail or site-by-site selection of funded facilities, the minimum elements to describe proposed facilities for an optimum operation alternative are:

- descriptions of the common type of on-site system failures in the area with known, on-going failures located on a map of the planning area,
- analysis of the site, usage, or design factors which cause the failures
- technology selection criteria which relate local problems and their causes to feasible structural and non-structural solutions
- the estimated number of on-site systems requiring upgrading, replacement or renovation, and
- the approximate mix of methods estimated to be required to correct failures.

The final stage of development for optimum operation alternatives involves investigations of each on-site system that might require funding, and selection of specific technologies and their design for individual properties. These investigations would include at least an interview with the resident and inspection of the property (on-site sanitary inspection). Detailed site analysis to verify performance or to refine design parameters would be conducted as necessary (see Figure II-A-1).

This EIS contains special cost curves developed for preliminary comparison of on-site, small scale off-site, and centralized alternatives. This level of analysis can determine the alternatives to consider for a Plan of Study (Step 1 grant application) and estimate the cost of various technology assumptions. It can be used for community-wide cost analysis or segment-by-segment within a community. Alternatively, present worth costs can be developed at this stage using local unit costs and technology assumptions.

After system selection, more detailed present worth calculations are possible. Comparison of centralized alternatives with optimum operation alternatives should include items not common to both. Eligible and ineligible publicly funded items as well as privately purchased items should be included for all alternatives.

After the sanitary survey and detailed site analysis, facilities verification may depend on micro-scale cost-effectiveness analysis for individual lots or groups of lots. In particular, comparison of higher risk on-site systems with holding tanks, cluster systems or other off-site technologies may require this most detailed level of cost analysis.

Because the cash flow characteristics of centralized alternatives differ greatly from optimum operation alternatives, an average annual homeowner cost is described for use in local economic impact analysis. All local public and private costs committed for the initial year of operation are divided by the number of dwelling units served.

## Community Management

Governmental concern with the use of on-site systems has reflected perceived and actual inadequacies of early systems. At present, most governmental authorities regulate the installation of new systems and can require upgrading and replacement of failing on-site systems. However, few authorities have accepted the responsibility for supervising the operation and maintenance of on-site systems.

The 1977 Clean Water Act recognized the need for continuing supervision of on-site system operation and maintenance. U.S. EPA Construction Grant regulations and program guidance which implement the Act require that before a construction grant for on-site systems may be made, the applicant must meet several requirements, including:

- Certify that such treatment works will be properly operated and maintained...
- Demonstrate the legal, institutional, managerial, and financial capability to ensure adequate building and operation, maintenance and replacement of the treatment works
- Provide assurance of access to the systems at all reasonable times for such purposes as inspection, monitoring, building, operation, rehabilitation, and replacement.

These and other relevant requirements for the management of funded on-site facilities are broadly stated so that a wide range of management programs is possible.

If on-site systems impacted water quality and public health only for the properties on which they lie, the community would not be concerned with anything that happens on private property. However, on-site systems can have off-site impacts. Density of development, failure rates, and sensitivity of water resources may lead to impacts requiring community action. The EIS describes five general management models reflecting different degrees of community authority and involvement.

The design of small waste flows management programs reflects existing or projected community characteristics and potential consequences of program design decisions. Specific factors are listed in Table 1.

Six steps that may be taken in designing a management program are:

1. inventorying factors affecting the design process,
2. making decisions on system ownership and liability,
3. identifying services to be provided,
4. determining how selected services will be performed,
5. determining who will be responsible for providing services, and
6. implementing the management program.

Three of the steps select, specify procedures, and assign responsibility for services to be provided. Table 2 lists potential services. They are more fully described in the Technical Reference Document, Chapter VI-A.

A public management agency need not provide all of the selected services or even be a new agency. Private contractors and homeowners could provide several non-regulatory services under agency supervision. Existing agencies could agree to cooperate in running the management program without creating a new level of government.

## TABLE 1. FACTORS TO BE CONSIDERED IN THE DESIGN OF SMALL WASTE FLOWS MANAGEMENT PROGRAMS

Existing or Projected Community Characteristics

- types of wastewater facilities utilized and proposed,
- expertise available to the community,
- size of the community or management district and number of systems in use,
- available regulatory authority,
- community jurisdictional setting,
- community attitudes toward growth, and
- community attitudes toward public management of private wastewater facilities.

Potential Consequences of Program Design Decisions

- costs, including initial costs and economic impact of failures,
- environmental impacts, especially impacts on water resources, and
- level of risk assumed by various parties.

## TABLE 2. POTENTIAL MANAGEMENT PROGRAM SERVICES

Administrative

- Staffing
- Financial
- Permits
- Bonding
- Certification programs
- Service contract supervision
- Accept for public management privately installed facilities
- Interagency coordination
- Training programs
- Public education
- Enforcement
- Property/access acquisition

Technical

- System design
- Plan review
- Soils investigations
- System installation
- Routine inspection and maintenance
- Septage collection and disposal
- Pilot studies
- Flow reduction program
- Water quality monitoring

Planning

- Land use planning
- Sewer and water planning

Factors affecting the design of a community's management program are discussed including:

- public involvement in agency design and operation,
- use and construction variances,
- gaining access to on-site systems,
- implementing water conservation programs,
- monitoring groundwater and surface water,
- recovery of local costs,
- personnel, and
- revising the management program.

## Facilities Planning Techniques

An early task in the Construction Grants process is delineation of facilities planning area boundaries. There are several factors to be considered in doing this. For rural areas where the optimum operation alternatives may be selected, planning areas should be large enough to take advantage of economies of scale in management program costs.

The Cost Variability Study prepared for this EIS provides environmental and developmental criteria to identify at an early stage planning areas where optimum operation may be cost-effective. Table 3 indicates housing densities below which even extensive (50%) replacement of on-site facilities will be cost-effective compared

TABLE 3. TRADE-OFF DENSITIES (IN HOMES PER MILE) ABOVE WHICH OFF-SITE FACILITIES ARE COMPETITIVE. BASED ON 50% REPLACEMENT OF ON-SITE SYSTEMS AT 0% AND 50% GROWTH. (Revised from the Draft EIS)

| Scenarios | Collection only |  | Centralized treatment |  | Land application |  | Cluster system |  |
|---|---|---|---|---|---|---|---|---|
|  | 0% | 50% | 0% | 50% | 0% | 50% | 0% | 50% |
| 1 No constraints 8' adc[1] | 45 | 69 | 93 | 125 | - | - | - | - |
| 2 No constraints 16' adc | - | - | - | - | - | - | - | - |
| 3 Steep topography 1 pump | 57 | 81 | - | 137 | - | - | - | - |
| 4 Flat; 6' to groundwater; peat[2] | - | - | - | - | - | - | - | - |
| 5 Flat; 6' to groundwater | - | - | - | - | - | - | - | - |
| 6 Steep topography; 1 pump; 6' to bedrock | 77 | 113 | - | 150 | - | - | - | - |
| 7 Flat | 75 | 109 | - | 144 | - | - | - | - |
| 8 Steep topography; 2' to bedrock; 50% of houses need grinder pumps | 76 | 111 | - | 138 | - | - | - | - |

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[1] adc = average depth of cut.
[2] Imported fill needed to replace 1,000' of peat soil.
- Greater than 150 homes per mile.

to off-site technologies. In general sewering any area already developed with on-site systems will not be cost-effective if new transmission and treatment facilities are needed in addition to new house and collector sewers. Sewering becomes cost-effective at densities below 100 dwellings/mile of collector sewers where construction problems are minimal, the area served is near existing sewers, and capacity is available in the existing sewers and treatment plant. For most rural areas this means the choice between centralized and optimum operation alternatives will be based on the ability of on-site systems to remedy water quality and public health problems, not on present worth comparisons.

Advance planning by grantees can also expedite their facilities planning. Steps they could take in anticipation of facilities planning include initiation of public information programs, planning for recreational resource development, and defining community goals and objectives for land use and water resources.

Population projections and economic impact analysis for rural communities are seriously limited by data availability and applicability. There are several ways to overcome these limitations. A particular problem in rural lake communities is projection of seasonal populations. In some cases where population projections or residential economic impact are critical to decision making, resident surveys or tabulation of local tax or building permit data may be necessary.

Design codes for on-site systems have served as de facto zoning tools and have protected some environmentally sensitive areas such as wetlands, steep slopes and flood plains. They have also occasionally been misused to actually prevent upgrading of existing systems. Sewers can overcome the natural constraints that limit on-site systems. New small waste flows technologies may partially or entirely overcome the same constraints. Grantees can anticipate these changes by conducting environmentally-based land use planning before or in conjunction with facilities planning. Methods for environmental constraints evaluation are recommended that will be useful in land use evaluations, population projections and environmental analysis.

Consideration of water resources was consistently one of the weakest elements in the facilities plans that the Seven Rural Lake EIS's evaluated. Approaches to evaluating existing problems and future impacts of alternatives are recommended.

Pathogen contamination of drinking waters and primary contact waters by septic tank effluents is unacceptable and, where detected, must be abated. Systems should be upgraded, replaced or abandoned as appropriate, provided there is a reasonable connection between the contamination and on-site failures. Since relevant data is seldom available, sampling of properly constructed wells and selected leachate plumes is recommended.

Abandoning on-site systems along shorelines will seldom result in significant change in plant productivity within the main body of lakes. A new graphical analysis technique estimates the concentration of total phosphorus in a lake due to on-site systems. This first-approximation analysis requires normally available data on the number of on-site systems, lake morphometry and lake hydrology. The results can guide subsequent decisions whether to conduct more intensive modeling and water quality sampling.

While effects of on-site systems on the trophic status of an entire lake will usually be minor, localized impacts can be more apparent and of greater public interest. Localized impacts include nearshore plant growth stimulated by leachate plumes at their point of emergence and plant growth stimulated by accumulation of nutrients in embayments or canals. Based on observations and analysis during preparation of the Seven Rural Lake EIS's, preventing nearshore plant growth along open shorelines of a lake will seldom be a sufficient justification for abandoning on-site systems. However, abandonment of systems adjacent to particularly sensitive embayments and canals may be justified if the plant growth impedes beneficial uses of the water, if on-site systems are shown to contribute substantially to the growth, and if non-point source control measures also are implemented prior to or along with the construction of off-site facilities.

Communities applying for U.S. EPA Construction Grants funds must demonstrate in their facilities plans that they have the necessary financial resources to insure the adequate construction, operation and maintenance of proposed facilities. There are several ways to determine municipal fiscal capabilities.

For residential economic impact analysis, this EIS recommends use of a parameter that accommodates the very different cash flow characteristics of centralized and optimum operation alternatives. The "average annual homeowner's cost" amortizes first-year private and local public capital costs at appropriate mortgage or bond periods and rates. To the annual debt repayment are added annual administrative costs, operation and maintenance costs and reserve fund payments. The community total for the first year is divided by the number of existing dwelling units. Comparison of this economic parameter with resident income characteristics provides a useful means of economic impact analysis.

Assessment of economic impact might also include use of locally available equipment, material, and labor. Small waste flows technologies can usually be installed with local inputs whereas much of the equipment and labor for centralized facilities will be imported from outside the community.

Planning for wastewater facilities in rural and developing communities provides opportunities for public participation not available normally in urbanized settings. In particular, the inspection, evaluation, and construction of on-site facilities will result in numerous contacts between residents and planning personnel. These contacts can provide a personalized forum for explaining the purpose and methods of the project. The contacts can also be a way for citizens to participate in the planning process.

Disputes between property owners and facilities designers will arise over the type of facilities to be installed, their cost or disruption to the property. A method for dealing with such disputes is a sanitary review board. Analogous to a zoning board, a sanitary review board would be made up of citizens of the community who would weigh owners' concerns against public concerns about cost, water quality, and public health.

To organize data and calculations, facilitate service area delineations, organize field work and allow small scale analysis of socioeconomic, environmental and land use characteristics, facilities planners may decide to segment planning areas. Planning areas can be segmented on the basis of soils classifications, housing or land use patterns, on-site system failure rates, housing occupancy, or other locally relevant criteria.

## Funding and Administering the Optimum Operation Alternative--Mitigative Measures

Growing awareness of the benefits available from small waste flows management and of the obstacles to realizing those benefits has led to numerous clarifications of the requirements of the Clean Water Act and regulations implementing it. The December 1981 amendments to the Act, recently revised Construction Grants Program Regulations, consolidated

Program Guidanace, and Region V's "Guidance for Site Specific Needs Determination and Alternative Planning for Unsewered Areas" clarify many of these requirements. Several requirements relevant to planning, funding, and implementing optimum operation alternatives are reviewed in this EIS including:

- On-Site Systems for Seasonal Properties--Duration of residency is not a determinant of eligibility where public ownership of on-site systems or its equivalent are feasible. For on-site upgrading or replacement, adequate access and public control, documented need and demonstrated cost-effectiveness will allow efficient distribution of construction grant funds.
- Use of Ordinances for Access--A local or county ordinance that grants the access (at reasonable times) and control over an on-site treatment system is sufficient to establish public ownership and thus eligibility.
- Field Testing--The 1981 amendments to the Clean Water Act authorize Federal grants for field testing of innovative and alternative technologies.
- Conventional Water Use--Facilitating unrestricted water use does not justify abandoning on-site treatment systems if water use restrictions and/or subcode sized drainfield replacements can protect water quality and public health.
- Potential Failures--Upgrading and replacement of existing on-site systems identified as potential failures because of obvious underdesign or other reasons are eligible provided they are similar to systems that have already failed. Similarity is measured by system design, usage, soil characteristics, site limitations and groundwater hydrology.
- Simplified Easements--In areas where a legal description of the properties to be served by an on-site wastewater management district may already be available, a simple "fill in the blanks" easement may be adequate to fulfill the access requirements of 40 CFR 35.918-1(h) and 35.2110.
- Innovative and Alternative Off-Site Facilities--Facilities such as holding tanks, cluster systems, sand filters with surface discharge, or other small-scale treatment methods will be eligible only if documented problems cannot be abated by any combination of on-site measures, or if the present worth of off-site facilities for a dwelling or group of dwellings is less than the present worth of the appropriate on-site facilities for the same dwellings.

Objections to the optimum operation alternative include the claim that it will not result in property value increases that often follow installation of sewer systems. A theoretical case can be made for including property value changes in cost-effectiveness analysis since they would represent monetized social impacts. However, modification of current cost-effectiveness analysis guidelines to allow inclusion of property value changes is not practical at this time since there are no data or experiences with which to estimate changes associated with the optimum operation alternative. In addition, numerous cases exist where high sewer charges have actually reduced property values.

Small contracting firms with little experience in dealing with U.S. EPA projects may be discouraged by the Davis-Bacon Act requirements from bidding on small waste flows projects. This would reduce competition and possibly increase the cost of projects. To lessen the impacts of the Davis-Bacon Act on on-site facilities contractors, U.S. EPA can request that the U.S. Department of Labor establish project wage determinations on individual projects until enough data have been collected to establish general wage guidelines for these types of projects. The Department of Labor also should be requested to change the classification of small waste flows projects from heavy construction to commercial or residential construction. In addition, U.S. EPA and state Construction Grants agencies can take the initiative to educate smaller businesses on the requirements of the Davis-Bacon Act.

For many communities, an optimum operation alternative may require changes in existing state regulatory and institutional requirements. This EIS recommends that the states in Region V:

- Review state policies regarding continued use of existing on-site systems.
- Develop procedural guidance for counties and municipalities to use for evaluation, upgrading, replacement and repair of existing on-site systems.
- Specify property owners' rights in the continued use of on-site systems and their responsibilities for repair, upgrading, or replacement with and without a small waste flows management program.
- Either test in court the implied authority of civil divisions to implement small waste flows management programs or legislate explicit authority for this purpose.
- Review the regulatory and institutional powers of civil divisions to gain necessary access to private wastewater systems for public management.
- Review the need for modification of variance criteria and procedures particularly in regard to existing on-site systems.
- Review state policies toward the use of innovative technologies weighing potential risks against economic savings.

In addition to evaluating obstacles to small waste flows management, state and regional agencies might provide planning, technical and grant or financial administration assistance to small communities. Some of the possibilities are summarized below:

- State and regional planning agencies could assist communities in defining local development goals and wastewater needs. Where local goals are inconsistent with U.S. EPA goals for Construction Grants funding, the states may assist communities in finding alternative funding sources or in a reassessment of goals.
- Planning assistance may be provided in identifying rural areas where wastewater improvements are needed and in delineating facilities planning area boundaries.
- States could establish separate priority lists for small communities.
- States could provide technical and grant administration assistance directly or through contractors.

This EIS calls for a higher level of community management than presently provided where needed to control the adverse impacts of on-site systems. This will require additional trained manpower. Attempts to quantify the necessary increase in personnel have been unsuccessful because relevant data are not available on the manpower currently working in this field and on the number of small waste flows projects that might be implemented. Training of existing and additional personnel could be provided through university degree programs, workshops, research and demonstration projects, on-the-job training and preservice training. Education programs should also be directed toward homeowners and residents.

The success of small waste flows programs and the actual savings acheived by them will be determined in large part by grantee's motives for improving local wastewater facilities. These motives include:

- avoiding prosecution,
- malfunctioning septic tanks,
- residential and commercial growth, and
- industrial growth.

## Environmental and Social Consequences of the Proposed Actions

The proposed actions will impact groundwater quality, lake water quality, environmentally sensitive areas, local government finances, present and future property owner economic burdens, operations of utility contractors and local equipment suppliers, land use and resident privacy and inconvenience.

Nitrate and bacterial contamination are the chief concerns related to septic tank effluent discharges to groundwater. At the housing densities and in the hydrogeologic settings studied in the Seven Rural Lake EIS's, contamination of wells by septic tank effluent was not shown to be a problem. The low density, linear development, and lack of fractured or channeled bedrock in the study areas appear to preclude well contamination even in areas of high groundwater. Indeed, high groundwater may actually protect wells since well screens used in many glacial deposits draw water from levels deeper than the effluent plumes.

Contamination of groundwater by viruses and toxic substances that may be discharged with sewage are unresolved concerns. Nevertheless, insufficient data exists to define either the prevalence or public health implications of such contamination. Thus, while this EIS gives broad support for the continued use of on-site systems, it also recognizes the need for better analysis of this concern than is now possible. Therefore, Region V will work with the states in the Region to investigate the prevalence of viruses and toxic substances in wells. As an initital proposal, this EIS recommends:

- sampling of selected, properly protected wells previously found to exceed bacterial or nitrate standards and suspected of contamination by nearby on-site systems,

- concurrent sampling of suspected wastewater sources, and

- because of cost, limitation of sampling to single facilities planning areas representative of each physiographic province in the region.

In facilities planning areas characterized by linear, single- or double-tier development in nonfractured and nonchanneled geology, description of groundwater resources based on available well logs and sampling data augmented by representative sampling of properly protected on-site wells will normally suffice for assessing impacts of on-site systems on groundwater. In other settings, the existence or possibility of adverse impacts should be assessed by a professional geologist or hydrogeologist.

Bacterial contamination can be identified by available survey and sampling methods. The most likely routes of bacterial contamination from existing on-site systems are direct discharges and overland runoff of surface malfunctions. Groundwater transport of bacteria to lakes is possible but appears to be rare. On-site systems in sandy or gravelly soils and very close to lakeshores are suspect and should be examined as sources of bacterial contamination. On- and off-site technologies are available to remedy bacterial contamination of lakes.

Nutrient inputs can increase aquatic productivity of a lake as a whole and stimulate local plant growth. Localized stimulation may be at the point of plume emergence or in sensitive parts of lakes such as embayments and canals.

Nutrient inputs to most lakes from on-site systems are generally small compared to total nutrient loads. The nutrient of primary concern is phosphorus. Except in small lakes with high lake surface area to watershed area ratios and with large numbers of nearby on-site systems in sandy soils, the beneficial impact of sewering on lake trophic status will be small. Trophic status improvements will seldom be a supportable reason for abandoning on-site systems.

Accumulation of phosphorus from on-site systems in poorly mixed parts of a lake can result in nuisance plant growth well in excess of growth in the main body. Where it can be demonstrated that 1) on-site systems are substantially contributing to nuisance plant growth, 2) abandonment of on-site systems is cost-effective, 3) all other nutrient control methods have been evaluated including non-point source control methods, and 4) the community will commit to implementing other methods that are practically and economically feasible, then facilities that allow abandonment of on-site systems adjacent to such sensitive parts of a lake will be eligible.

Plant growth at the point of effluent emergence into the open waters of a lake seldom interferes with recreational or other uses of the water. Availability of suitable substratum, wave action, and fluctuations in lake level normally control such nearshore plant growth naturally before it becomes a nuisance. On-site upgrading and replacements may incidentially reduce this growth, and innovative techniques such as effluent plume recovery may eliminate it. Abandonment of on-site systems adjacent to the main body of lakes solely for the purpose of controlling nearshore plant growth will not be eligible unless the growth impedes beneficial uses of the water and is shown to be stimulated by wastewater effluent.

Development of several types of environmentally sensitive areas, especially floodplains, wetlands, and steep slopes, has historically been prevented by on-site sanitary codes and by the fact that conventional on-site systems will not operate in them. Various technologies that may be included in an optimum operation alternative, such as cluster systems, mounds and holding tanks may overcome the natural constraints and allow development in these areas as well as in prime agricultural lands, habitat for rare and endangered species, and historic and archaeologic sites.

This EIS recommends the use of technologies that overcome natural constraints only for existing buildings. Approval of future on-site and small scale technologies is under state and local control. Hopefully, these governments will be cautious about approving any wastewater systems in environmentally sensitive areas.

Many state statutes limit the amount of debt that can be incurred by municipal and county governments. Implementation of the optimum operation alternative will enable local governments to incur less debt than under conventional centralized alternatives because of lower capital costs and local share. The Seven Rural Lake EIS's indicated that publicly financed local costs were reduced between 89% and 98% under some on-site alternatives. Local governments will be able to finance schools, hospitals, and other community facilities rather than needlessly expensive wastewater facilities.

Operation and maintenance costs will not be reduced in proportion to capital reductions but will generally be lower than with properly maintained conventional facilities. As with conventional centralized facilities, operation and maintenance costs associated with the optimum operation alternative can be passed directly to users. County and municipal governments that had previously required property owners to bear all the costs and responsibilities of on-site systems will incur new administrative costs. This is due to the increased role of local governments in the overall management of these systems under the optimum operation alternative. Because of the flexibility local governments have in the design of small flows management agencies, they can match their costs to the severity of local water quality problems.

In unsewered communities where the optimum operation alternative is feasible, the economic burden on present property owners, as a group, will be less than it would be if a conventional centralized alternative were selected. The actual economic burden placed on present property owners may vary from residence to residence depending on the manner in which capital, operation and maintenance, reserve fund, and administrative costs are allocated. How these costs are distributed is a decision that will have to be made at the local level.

Future property owners served by on-site systems will have to pay the full capital costs of their systems unless local governments wish to subsidize them. U.S. EPA policy is not to subsidize future growth through the Construction Grants program. Future capital costs for on-site systems are deferred over the 20-year project period and are unlikely to be funded by local government.

Certain lots may require a very expensive on-site technology. The individual costs on these lots in the future may equal or exceed the individual shares of subsidized centralized facilities, if these facilities were available. In cases where sewered off-lot technologies are selected over on-site alternatives, the magnitude of economic impacts on future property owners will be locally determined.

The implementation of small waste flows technologies in rural areas can positively impact on local utility contractors and equipment suppliers. Most construction services and equipment for on-site and small-scale technologies can be locally supplied. In contrast to conventional centralized facilities where outside firms are typically used, optimum operation alternatives may lead to the retention of more local, state, and Federal funds in the rural community. Competition for contracts to construct and provide supplies for small waste flows systems is likely to come from non-local firms that have established expertise with these technologies. The degree to which Construction Grants funds are retained locally will depend on the ability of local contractors to perform work on government contracts. In some cases, the project workload and meeting of Federal contracting regulations, such as the Davis-Bacon Act, may currently be more than small rural area firms can handle.

Adoption of optimum operation alternatives may restrain the amount, rate, and density of development in communities within a reasonable commuting distance of employment centers. Often large lot size requirements are called for by local sanitary codes to protect the quality of groundwater used as domestic water supply. These lot size requirements for new dwellings will probably not change as a result of adopting alternative on-site treatment technologies since water well to treatment system separation distances will be retained. The net effect of such constraints on new development may be adverse or beneficial depending on local community development objectives.

Cluster systems that use off-site soils circumvent development controls based on sanitary codes and soils limitations. Cluster systems may thus permit considerably higher density residential development. High density development may be counter to local development objectives. Cluster systems may permit infilling within existing development areas resulting in loss of open space buffers between existing development, and into areas possibly unsuitable for residential development. Multifamily systems could have a positive impact where planned higher density development permits conservation of open space in contiguous areas.

The predominant settlement pattern and housing type in the Seven Rural Lake EIS communities were single-family detached residential units in single-tier development around lakeshore areas. Other rural areas depending on on-site technology are also single-family units in small subdivisions or in dispersed low density patterns. This pattern has been determined by transportation access to lots and by spatial distribution of suitable soils. If on-site technologies continue to be used, this development pattern may lead to a situation where the future options to sewer may be precluded by the great expense of sewering dispersed homes. Further dependence upon local sanitary codes may thus severly restrict the amount and distribution of developable land in lake areas. Such restrictions may be counter to local development goals as well.

Local access and control over on-site systems, although required by both the Clean Water Act and common sense, raise concerns about individual privacy and the sanctity of private property. The establishment of on-site permit requirements a generation ago raised similar concerns. A poorly planned, designed or funded version of the optimum operation alternative might not offer benefits worth the costs that it incurs, whether in money or privacy. Any transfer of authority to government reduces individual choices, and may make some residents feel helpless, or more nearly so. For this reason community authority should be exerted tactfully and sparingly, balancing public health and water quality needs against any infringement of privacy.

For many properties, modification of on- and off-site small waste flows facilities will have as an incidential benefit the removal of practical restrictions to water use. New or upgraded systems may handle dishwashers, clothes washers, garbage grinders, and additional occupants, which previously were avoided or prohibited. Some properties will not be so unencumbered, such as those on small lots for which existing, subcode, or innovative facilities will be adequate with minimum water usage and for which off-site facilities are not affordable.

# TERMINOLOGY

During the preparation of this Environmental Impact Statement, new and existing ideas were synthesized into the concept of rural wastewater management described here. To make the verbal presentation meaningful yet consistent, it has been necessary to rely on terms which are new or have not been adequately defined elsewhere. Readers are encouraged to review these terms prior to reading the text.

Small Waste Flows - Wastewater streams, typically of domestic sewage, generated at individual housing units or small commercial, institutional and industrial sites, and disposed of near the site of generation with a minimum of flow aggregation in sewers.

Small Waste Flows Technologies - The methods for transporting, treating and disposing of small waste flows. Includes a variety of on- and off-site methods.

Small Waste Flows Management - Supervision of all phases in the life cycle of small waste flows facilities. Includes provision of specified services by a management agency, delegation and oversight of services provided by other organizations and by homeowners, and services necessary to maintain the management agency itself.

Small Waste Flows Facilities - Structures and equipment installed to transport, treat or dispose of small waste flows.

Small Waste Flow Systems - Combinations of small waste flow facilities designed to process individual small waste flows.

On-site System - Small waste flows facilities located on the property where a wastewater stream is generated and operating together as a system to transport, treat and dispose of that wastewater stream. May also include systems located nearby but off-site and serving only one building. Includes non-water consuming facilities such as compost toilets, incinerator toilets, pit privies, chemical toilets and recycling systems but not other flow reduction devices.

New Construction - Small waste flow systems installed to serve newly constructed or future buildings.

Replacement - Small waste flows facilities or systems installed to replace existing facilities or systems that are abandoned. Generally implies that a new location will be used for the replacement.

Upgrade - To modify the design of existing small waste flows facilities or systems in order to improve their operation.

Repair - To fix or renovate existing facilities and to replace parts of facilities such as lengths of pipe, sanitary tees, pumps, etc.

Management Service or Service - The duties that may be included in a management program. Specifically excluded from this definition are the methods by which services can be delivered. Also termed "functions" in the Seven Rural Lake EIS, Technical Reference Documents supporting this EIS and other literature concerning small waste flows management.

Management Agency - The organization (or multiple organizations operating under an interagency agreement) responsible for assuring the successful delivery of selected services.

Management Program - A plan for providing necessary services in a small waste flows district. The plan should describe funding, organization of the management agency, services to be provided, parties who will provide the services, methods by which selected services will be delivered, and designation of liability for remedying future failures.

Small Waste Flows Project - The planning, technology selection, system design, management agency design and construction of an Optimum Operation alternative.

Small Waste Flows District - The geographic area within which a management agency has supervisory responsibilities for small waste flow systems.

Optimum Operation Approach - Wastewater management in unsewered communities that emphasizes the optimum operation of existing on-site systems, use of other small waste flows technologies as appropriate, and small waste flows management.

Optimum Operation Alternative - In facilities planning, the description and cost estimate of new or upgraded small waste flow facilities and associated management program for a specific small waste flows district.

Technology Assumptions - Estimates, based on available data and community survey results, of the number of existing systems that require upgrading, replacement or repair, and the mix of technologies needed to do so. Since technology assumptions are not necessarily based on on-site sanitary inspections or site-specific analysis, they are appropriate primarily for describing and costing preliminary optimum operation alternatives for comparison with centralized alternatives.

Technology Selection - Identification of the upgrading, replacement or repair expected for individual systems based on available data, community survey results, partial sanitary surveys and representative sampling of soil, groundwater and surface water. Technology selections are tentative and subject to change pending completion of sanitary surveys and, where indicated, detailed site analysis.

Facility Verification - Confirmed or revised technology selection for individual systems based on completion of sanitary surveys and, where indicated, detailed site analysis. For commonly used facilities, reference to or incorporation of standard designs and specifications is part of facility specification. For unique facilities, facility specification requires individual designs and specifications.

On-site Sanitary Inspection - Patterned interview with a resident followed by a walk-over inspection of his or her property to collect and record opinions and data on the location, age, condition, design and use of on-site wastewater and water supply systems. Sampling of the water supply, soil borings, or other representative sampling, may be scheduled concurrently with the on-site sanitary survey but are not included in the definition.

Sanitary Survey - An inventory of the location, age, condition, design and use of on-site systems in all or parts of a community based on available data and numbers of on-site sanitary inspections. Random sanitary surveys are designed to fairly estimate the proportion of on-site systems requiring upgrading, replacement, or repairs. The design of targeted sanitary surveys relies on available data to identify suspected problem areas where extra attention is given to identifying the causes of local on-site system failures, that is, to analyze worst case conditions.

Detailed Site Analysis - The sequence of investigations and decisions made to determine the causes of problems with existing on-site systems and to develop information for selecting appropriate repairs, replacements or upgrading.

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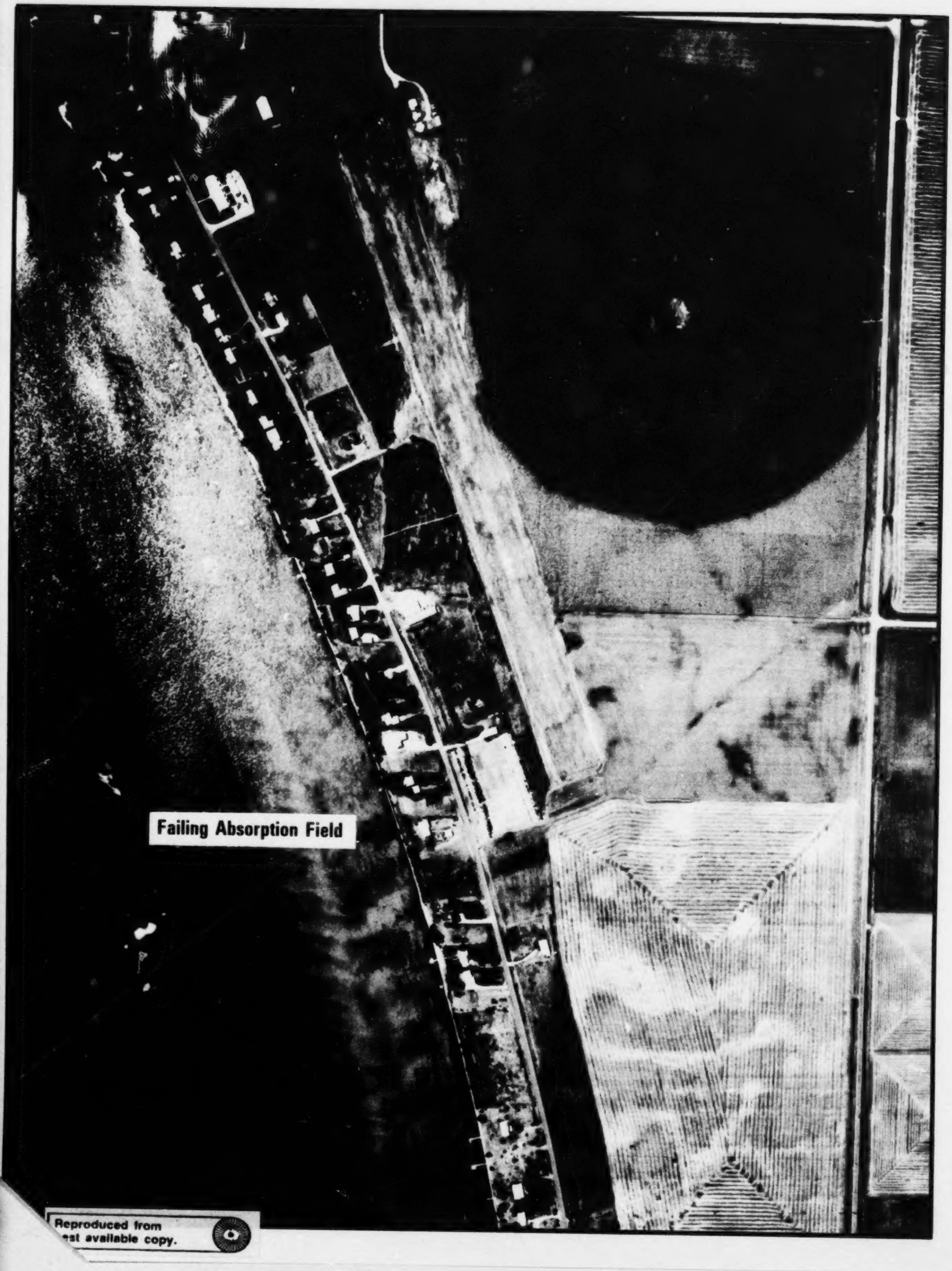
# Chapter I

## What This EIS Does And Why

(Purpose Of And Need For Action)



Failing Absorption Field

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# CHAPTER I

# WHAT THIS EIS DOES AND WHY (PURPOSE OF AND NEED FOR ACTION)

## A. WHAT IS IT ABOUT (SCOPE)

The Federal actions examined in this Environmental Impact Statement (EIS) are the review and approval of facilities plans by U.S. EPA Region V for Construction Grants activities in unsewered communities. The topics evaluated here apply to those rural and developing areas where responsible governments must solve existing water quality and public health problems by:

- centralized approaches--installing new sewers and centralized treatment facilities--or
- small waste flows technologies and management--optimizing the operation of existing on-site systems and construction of new small scale treatment facilities where appropriate.

EIS I-C-4 TRD X-A This EIS emphasizes unsewered lake communities because of their large number and environmental significance within the Region. Issues, alternatives, and methods unique to them are, therefore, given as much attention as topics that are generally applicable to any unsewered community. This emphasizes, for examples, treatment facilities that do not discharge to surface waters, consideration of seasonal users, and lake eutrophication modeling.

Many topics discussed in this EIS respond to problems and opportunities addressed during preparation of seven individual EIS's for rural lake projects. This series, "Alternative Waste Treatment Systems for Rural Lake Projects," began July 20, 1977 with seven Notices of Intent. The projects and dates of completion or most recent U.S. EPA action include:

- Case Study Number 1: Crystal Lake Area Sewage Disposal Authority, Benzie County, Michigan (Final EIS July, 1980);
- Case Study Number 2: Green Lake Sanitary Sewer and Water District, Kandiyohi County, Minnesota (Final EIS December, 1980);
- Case Study Number 3: Springvale-Bear Creek Sewage Disposal Authority, Emmet County, Michigan (Final EIS December, 1980);

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Legend for Cross-references in Margins

| | |
|---|---|
| EIS I-C-2 | Section of this EIS |
| TRD II-A | Section of the Technical Reference Document published separately |
| CWA 201(g)(1) | Section of the Clean Water Act which necessitates change in the text |
| 40 CFR 35.2110 | Section of the Construction Grants regulations which necessitates change in the text |
| CG 82-6.2. | Section of the program guidance document, Construction Grants - 1982, upon which change was based. |
| C.26. | Comment on the Draft EIS relevant to topic discussed (see Chapter VII) |

All significant changes from the Draft except new sections are identified by underlining.

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- Case Study Number 4: Steuben Lakes Regional Waste District, Steuben County, Indiana (Final EIS January, 1981);
- Case Study Number 5: Otter Tail County Board of Commissioners, Otter Tail County, Minnesota (Final EIS November, 1980);
- Case Study Number 6: Salem Utility District No. 2, Kenosha County, Wisconsin (Preliminary Draft EIS sent to applicant and the state, EIS preparation terminated July 1979); and
- Case Study Number 7: Williams County Commissioners, Nettle Lake Area, Williams County, Ohio (Final EIS published September 1982).

These Seven Rural Lake EIS's were specifically intended to evaluate the feasibility, cost-effectiveness, and environmental impacts of alternative wastewater collection and treatment systems. The alternative systems were compared to centralized systems that had been proposed in Step 1 Facilities Plans. Varying modular combinations of the two were also considered. To date, Final EIS's have been published for six of the case studies.

The first five EIS's recommended that grantees optimize the operation of existing on-site systems, replace or upgrade failing on-site systems with conventional or alternative on-site systems, and, where necessary, construct new subsurface land discharge systems for groups of buildings having problems with on-site treatment. The seventh case study, recommended an optimum operation alternative consisting of replacement or upgrading of malfunctioning systems and, where necessary in certain flood prone areas, use of chemical toilets, composting toilets, or vault privies and export of human excreta off-site. The EIS for the sixth case study was terminated at the Preliminary Draft stage because of a decision to proceed with state funding; the project, utilizing significant portions of EIS work, is being constructed.

One major finding of the Seven Rural Lake EIS's is that wastewater management based on optimum operation of existing on-site systems differs substantially from that based on either new centralized facilities or new small waste flows (on-site and small-scale) facilities. Another finding is that wastewater management based on existing systems allows substantial capital, operation, and maintenance savings compared to new centralized facilities wherever continued use of a substantial percentage of existing systems is feasible. Water quality objectives can still be met while realizing this cost savings.

## B. WHAT DOES IT WISH TO ACCOMPLISH AND HOW DOES IT PROPOSE TO DO IT (PROPOSED ACTIONS)

These Draft EIS and this Final EIS have three objectives:

1. to encourage active assessment of water quality and public health problems in unsewered areas,
2. to encourage evaluation of the optimum operation of existing facilities and other low-cost alternatives to correct those problems, and
3. to enable grantees to recognize situations in which the optimum operation approach is appropriate.

40 CFR 35.2030 These objectives are consistent with present regulations implementing the Clean Water Act, especially 40 CFR 35.2030, which states in part:

> A completed facilities plan must include:...(3) A cost-effectiveness analysis of the feasible conventional, innovative, and alternative wastewater treatment works, processes and techniques capable of meeting the applicable Federal, State, and local effluent, water quality and

public health requirements....A cost-effectiveness analysis must include:...(iii) an evaluation of improved effluent quality attainable by upgrading the operation and maintenance and efficiency of existing facilities as an alternative or supplement to construction of new facilities.

EIS I-C-2-a

As will be seen subsequently in an analysis of costs, these objectives are also consistent with present or future limitations on Federal allocations of Construction Grants funds.

CWA 204(a)(5)
CWA 204(c)
40 CFR 35.2123

In regard to grantee acceptance, it is recognized that optimum operation of existing on-site facilities will not always satisfy a common local objective of providing reserve capacity for future growth. The costs of reserve capacity are eligible for Construction Grants funding of conventional sewers and treatment plants if the grant is awarded before October 1, 1984. However, provision of reserve capacity is not an objective of the Construction Grants program. The absence or reserve capacity in optimum operation alternatives will not be grounds for finding conventional alternatives to be cost-effective.

Specific initiatives that comprise Region V's proposed actions are discussed in the following sections.

## 1. ENCOURAGE COMMUNITY SUPERVISION OF SMALL WASTE FLOWS FACILITIES

TRD XV-A

Within Region V, state and local laws require that most new on-site systems be approved and permitted prior to installation. This requirement applies regardless of proximity to existing development or type of water resources that may be impacted. Protection of nearby residents' health and of water quality are sought through design guidelines that must be met as a condition of permit issuance. The guidelines are, for most sites, conservative enough to protect public health and water quality even if future residents use water liberally and fail to provide the minimum maintenance expected.

Communities also provide enforcement services when systems fail. Typically, this involves responding to complaints from owners or neighbors and encouraging owners to make suitable repairs.

EIS III-A-2
EIS III
TRD I

New construction requirements and enforcement services do not adequately protect water quality and public health in all areas, however, particularly where present housing densities are high, malfunction rates are high, or groundwater and surface water resources are sensitive to drainfield leachate. Communities may require additional measures to protect their interests. The traditional community response to the need for additional measures is to install sewers and treatment plants, if possible. The more direct response, controlling the source of the problem, may not be considered seriously. Control may require community supervision over one or more of the factors that together determine successful on-site system operation. These factors and examples of means for modifying or controlling them for existing systems are:

EIS II-A-2-b&c

| Factors Determining On-site System Performance | Example Control Measures |
|---|---|
| • system design | expand drainfield size; upgrade system with dosing, additional settling capacity, aerobic treatment; convert to alternate design such as shallow placement, mounds, evapotranspiration, or alternating drainfields |

| | |
|---|---|
| • system usage | install flow reduction devices; limit occupancy; prohibit garbage grinders; separate black water treatment; recycle laundry and bath water; public education; measure water consumption |
| • maintenance | renewable permits contingent on proof of periodic inspection and maintenance; public provision of maintenance services; required maintenance contracts between building occupant or owner and private firm; public education |
| • soil characteristics | change system design and/or usage; move drainfield; import soil fill |
| • site constraints (size and shape of lot; relationship to other lots; location of house, well) | evaluate system performance as it is affected by these constraints; evaluate design and usage modifications as means of overcoming site characteristics; acquire land off-site for wastewater disposal where necessary |
| • groundwater hydrology | install curtain drains, French drains, or drainage ditches, septic leachate recovery for irrigation |
| • surface drainage | disconnect roof drain connections to wastewater system; divert runoff away from septic tank and drainfield, mound soil over drainfield |

Many of these control measures have not been conclusively tested, largely because of the curious position that local governments find themselves in when they try to assess these measures. First, state and county governments place certain technical limitations on what may be done, providing no regulatory outlet for possible successful exceptions. Second, governments have historically been reluctant to intrude in any way on private property. Third, budget constraints make it easy to justify doing nothing.

TRD V-A

The lack of testing has produced a high degree of design conservatism among engineering consultants and sanitarians, the principal sources of professional advice available to local governments. This conservatism is self-perpetuating; until the control measures are tested, engineers and sanitarians will continue to recommend traditional wastewater systems.

Because of the new data and experience discussed in this EIS, U.S. EPA Region V strongly encourages state governments in the Region and those local governments contemplating new sewer projects to evaluate their opportunities for dealing directly with on-site system problems and to test the reasons typically given for not seizing those opportunities. In particular, the Region recommends increased community supervision of design, usage, and maintenance for existing on-site systems when necessary for the common good. U.S. EPA further recommends that the degree of supervision be determined by local housing density, rate and type of failure, and sensitivity of water resources to failures.

EIS III-A-2

## 2. DEVELOP EVALUATION METHODS FOR OPTIMUM OPERATION OF EXISTING ON-SITE SYSTEMS

TRD II-D-G

EIS II-D

EIS II-E

This second Proposed Action has been partially accomplished in the preparation of this EIS and the Seven Rural Lake EIS's. Two new evaluation methods, aerial photographic surveys and septic leachate detection, as well as a simple, effective form of sanitary survey were given their first full-scale applications during these studies. Evaluation of optimum operation of existing on-site systems is addressed throughout this EIS and the Technical Reference Document. Some of the topics, such as Construction Grant sequences for unsewered areas and eligibility of cost items, are applicable only if a community applies for Construction Grants funding. The majority of topics are relevant apart from any question of Federal funding.

As state and local organizations gain experience in applying these methods, improvements and new methods will doubtless be developed. U.S. EPA will help disseminate information on new and improved evaluation methods through the U.S. EPA Small Wastewater Flows Clearinghouse, West Virginia University, Morgantown, West Virginia 26506, and through the Small Waste Flows Coordinator in Region V's Chicago offices, Mr. Alfred E. Krause, 312/353-2126.

## 3. PROMOTE COLLECTION AND ANALYSIS OF ON-SITE AND SMALL-SCALE SYSTEM PERFORMANCE DATA

EIS I-C-5

A nearly universal obstacle to informed decisions for wastewater management in unsewered areas is lack of adequate local data on the design, use, and water quality impacts of existing conventional on-site systems. The situation is, of course, even worse for innovative systems.

EIS II-C

Some performance data is necessary to support Construction Grant applications for any unsewered areas. The need for performance data is even greater if the optimum operation approach is proposed. If sewers are proposed, the need for them must be documented. This requirement was stated in Program Requirements Memorandum 78-9:

> New collector sewers should be funded only when the systems in use (e.g. septic tanks or raw discharges from homes) for disposal of wastes from the existing population are creating a public health problem, contaminating groundwater, or violating the point source discharge requirements of the Act. Specific documentation of the nature and extent of health, groundwater and discharge problems must be provided in the facility plan . . . A community survey of individual disposal systems is recommended for this purpose.

Additional guidance on documentation of need was provided by Program Requirements Memorandum 79-8:

> Facility planning in some small communities with unusual or inconsistent geologic features or other unusual conditions may require house-to-house investigations to provide basic information vital to an accurate cost-effectiveness analysis for each particular problem area. One uniform solution to all the water pollution problems in a planning area is not likely and may not be desirable. This extensive and time-consuming engineering work will normally result in higher planning costs, which are expected to be justified by the considerable construction and operation and maintenance cost savings of small systems over conventional collection and treatment works.

Though house-to-house visits are necessary in some areas, sufficient augmenting information may be available from the local sanitarian, geologist, Soil Conservation Service representative or other source to permit preparation of the cost-effective analysis. Other sources include aerial photography and boat-carried leachate-sensing equipment which can be helpful in locating failing systems. Detailed engineering investigation, including soil profile examination, percolation tests, etc., on each and every occupied lot should rarely be necessary during facility planning.

(NOTE: PRM's 78-9 and 79-8 were canceled in 1981. The guidance discussed here is continued, however, in almost the same form in the new program guidance, Construction Grants, - 1982.)

TRD XVI-D Applying these policies during preparation of the Seven Rural Lake EIS's, Region V in cooperation with states in the Region developed additional guidance on the collection and use of performance data titled "Region V Guidance--Site-Specific Needs Determination and Alternative Planning for Unsewered Areas." It is Appendix A in this EIS. This guidance recommends phasing of data collection with decisions on alternative development and selection, ensuring timely data collection and avoiding unnecessary or redundant work.

The Region V Guidance also emphasizes performance as the relevant criterion for need. Though this seems obvious, facilities plans and state policies often rely on nonconformance with current design codes as the criterion for need. Use of nonconformance alone as a criterion would result in the abandonment of many older systems, even though they may have many more years of use remaining.

EIS II-D The Region V Guidance and this EIS cite several data collection methods.
The data apply particularly to local problems but they also help us to
understand how on-site systems work and affect our water resources. So
that performance data collected with Construction Grants funds can thus
EIS II-D-3 improve the state of the art, Region V will promote development of stand-
ardized on-site data formats and of data storage and retrieval systems.
Discussions with Headquarters and other offices in U.S. EPA and with state
201 agencies are planned.

### 4. REVIEW ELIGIBILITY REGULATIONS

EIS V-A-1 This EIS addresses a number of questions regarding grant eligibility raised during preparation of the Seven Rural Lake EIS's. Proposed eligibility guidelines are presented.

### 5. ENCOURAGE STATES TO PLAY ACTIVE ROLES IN RURAL WASTEWATER MANAGEMENT

TRD XV-A The evolution of state regulatory authority over on-site systems has not included explicit means or intent for evaluating and improving on-site system performance. Published regulations clearly define the design of new conventional on-site systems. However, inadequate existing systems are usually only discovered by the homeowner or neighbor after total failure. Repairs on existing systems are limited to those that the local sanitarian can persuade owners to make and usually consist of the same type of system that has already failed. States have legal and social obligations to define and ensure adequate sanitation. They are also bound by the political constraint that adequate sanitation be available at a reasonable cost. With some exceptions, the states have not clearly resolved the technical, legal, financial, and administrative problems associated with existing on-site systems. The number of non-cost-effective proposals for new sewer construction in rural areas testifies to this.

This EIS does not suggest that ready answers exist for every problem. How-
EIS V-B ever, a number of possibilities are discussed, primarily from local govern-
ment's point of view. Many of the possibilities require enabling legisla-
tion or regulations for which states retain authority. This EIS encourages

TRD XV-A the states within Region V to evaluate comprehensively their roles in the management of existing as well as new on-site systems and to provide localities with the necessary legal and information resources to provide their delegated management services. The states within Region V do not have to look extensively beyond the Region to find excellent examples of what can be done in this field.

## 6. RECOMMEND FACILITIES PLANNING AND IMPACT ANALYSIS METHODOLOGIES

EIS II-E-F
EIS IV
TRD X-XIV

This EIS and its Technical Reference Document use experience from the Seven Rural Lake EIS's to show several different ways to make planning decisions for unsewered areas. It can help in making these decisions whether or not they are part of a Construction Grants facilities plan. There are no mandatory rural facilities planning methods; grantees and consultants are free to choose the best method for satisfying state and Federal planning requirements.

## 7. ENCOURAGE CONSIDERATION AND USE OF MITIGATIVE MEASURES

EIS I-C-2
EIS IV-F

No wastewater facilities are completely free of potential adverse impacts. For rural communities, the most prevalent adverse impact of constructing new sewers and treatment facilities will be economic. Economic impacts can be avoided by implementing less costly alternatives, such as the optimum operation alternative, where feasible. Optimum operation may itself have potential adverse impacts, particularly on land use, groundwater quality, lake water quality, municipal finances, and homeowner finances. These impacts can be avoided during facilities planning or mitigated during and after construction. Other problems, such as non-point source pollution, may not be addressed by any wastewater management efforts.

EIS VI

This EIS will later discuss potential adverse impacts of the optimum operation alternative and ways to limit them. These mitigating measures can often both reduce impacts and save money; either of these is sufficient to recommend their consideration and use by the grantee.

## 8. ENCOURAGE PUBLIC PARTICIPATION

EIS III-D
IV-G
TRD XIV-A

Experience shows the public's interest in wastewater control projects is at least as great in rural lake areas as in any other type of community. This high level of interest is matched by a high level of awareness of and appreciation for local natural and social resources. We are recommending an approach to wastewater management that necessarily involves residents to a greater degree than do conventional sewered approaches.

In one sense this entire document is intended as an aid to public participation. Not just engineers and planners, but local officials and residents themselves need to understand enough of wastewater planning so that they can judge their own problems and needs. Intelligent and alert citizens can exercise a greater and more lasting degree of quality control than any state or Federal reviewer.

This document talks about ways to use the advice of an informed public in Construction Grants Program projects, especially those using the optimum operation alternative. By understanding the public's concern, consultants and officials can speed the progress of a project. Sometimes they may learn enough to improve, revise, or cancel it.

## 9. ENCOURAGE CREATIVE USES OF SMALL WASTE FLOWS TECHNOLOGY AND COMMUNITY MANAGEMENT

This document is intended to be a beginning not an end to discussions of small waste flows systems and community management. On parts of these matters, it offers new ideas and "state of the art" knowledge. We intended, however, to spur debate, analysis, and experimentation concerning alternative means of rural wastewater management. Our greatest hope is that within a short time this EIS will be obsolete because inventive consultants, demanding local officials, and alert involved citizens will have gone far beyond even our methods toward protection of public health and water quality at affordable costs.

## C. WHY DO THESE THINGS NEED TO BE DONE (THE NEED FOR ACTION)

### 1. HISTORICAL BACKGROUND

Septic tank/soil absorption systems were not constructed in really great numbers until after World War II. Pre-war rural electrification programs set the stage for suburbanization and rural development. Returning veterans, Federal home loan guarantee programs, rapid economic growth, and other factors contributed to rapid development outside of sewered urban areas.

At that time, public control over septic tank system installation was non-existent or only advisory. In response to frequent failures of these post-war systems, many sewers have been built. Some local and state governments sought ways to prevent failures through standardized design requirements, site evaluations, and permitting requirements. By 1957, the Taft Research Institute of the U.S. Public Health Service had studied septic tank system failures and recommended standard design requirements (U.S. Public Health Service, 1957). These design requirements still form the basis for many state regulations. TRD XV-A

During the 1960s and early 1970s, state and local governments formulated and implemented procedures for preconstruction approval of septic tank systems. These procedures and the standard design requirements greatly reduce the occurrence of surface malfunctions and plumbing backups for new systems. However, old and new systems that are overloaded or not maintained continue to fail. A third type of failure, groundwater contamination, has also been recognized as a potential problem.

Relying on such failures, municipalities and facilities planners continue to propose new sewers. This is done without exhausting means for improving the performance of existing systems.

TRD V Training and education programs in on-site wastewater management have, until the last several years, been rudimentary. Those programs available primarily reached public health sanitarians and system installers, not the consulting engineering community that now plans facilities for our rural communities. U.S. EPA is working to improve the availability of training and education programs through technology transfer seminars, the Small Waste Flows Clearinghouse, support of other organizations' programs, and preparation of this EIS and the seven previously mentioned case studies.

### 2. PROBLEMS WITH CONVENTIONAL COLLECTION AND TREATMENT FACILITIES IN RURAL AREAS

Three main problems with construction of new collection and treatment facilities in rural communities are high cost, uncertain performance, and adverse environmental impacts. While these obviously will not rule out new sewers in all rural and developing communities, they must be seriously considered.

#### a. Costs

The collection system is chiefly responsible for the high costs of conventional sewerage facilities for small communities. Typically, 80% or more of the total capital cost of wastewater facilities for newly sewered rural areas is spent for sewers. Figure I-C-1 indicates that the costs per residence for gravity sewers increase exponentially as population density decreases.

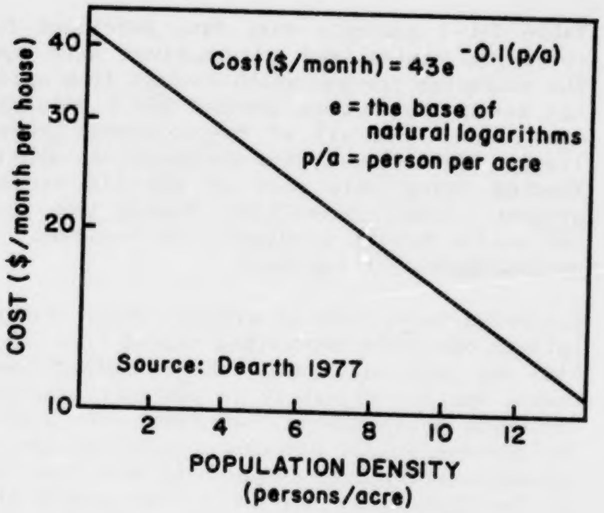

FIGURE I-C-1. MONTHLY COST OF GRAVITY SEWERS

Source: Dearth, 1977

This cost/density relationship arises from:

- greater length of sewer pipe per dwelling in lower density areas,
- more problems with grade, resulting in more lift stations or excessively deep sewers,
- regulations or criteria that set 8 inches as the smallest allowable sewer pipe diameter, and
- inability of small communities to spread capital costs among larger populations sewered previously.

New centralized facilities are capital intensive. The private capital (the money a homeowner pays directly to contractors) required for plumbing changes and house sewers may cost $1,000-$5,000. In some rural areas the homeowner may also have to install indoor plumbing and a new room for a bathroom. The property owner will also pay a part of the municipality's share of publicly-owned facilities. The property owner's part may be paid as soon as the project is built in the form of a hook-up charge or frontage fee. Charges of $2,000 per connection are not unusual. The public capital may also be recovered from property owner's over a period of time as installment payments on municipal bonds.

Like all wastewater facilities, centralized systems have operation, maintenance and replacement costs. Such costs incurred by municipalities for Federally-funded facilites must recover the costs through user charges.

Per household user charges for new centralized wastewater systems are highest in the smallest communities. An examination of 687 user charge systems approved by Region V through September 1980 revealed that all 10 communities with annual user charges over $200 had populations of 10,000 or less. Of the 17 communities charging $150 to $200 per year, 14 had populations of 10,000 or less. (Only communities that are building collection sewers and interceptors are included in this analysis.)

Table I-C-1 presents cost data developed for the Seven Rural Lake EIS's comparing centralized alternatives with optimum operation alternatives. The potential present worth savings from optimum operation alternatives for the seven communities totaled $50.9 million or $4,943 per dwelling unit equivalent. Not all of the potential present worth savings will be realized. One community has withdrawn its application for Construction Grants funding using only part of the EIS recommendations in a state funded project. Other communities, having seen the actual level of water quality and public health problems, are hesitant to build all parts of even the optimum operation approach.

EIS IV-F-2 Estimated reductions in average annual homeowner costs due to adoption of optimum operation approaches ranged from 58% to 90%, averaging 82% or about $405 per year per house. The estimated homeowner costs include all local costs, whether privately or publicly financed, with initial capital costs, including house sewers, amortized over a 30-year period. Therefore, while the average annual homeowner costs for the centralized alternatives appear extraordinarily high compared to most user charges, they include real costs to the homeowner that he or she would usually pay as hook-up charges, frontage fees, taxes, or direct payments to private contractors.

The most dramatic cost reduction was for publicly financed local capital costs, the part of the projects typically financed by bonds or loans to municipalities. Because of lower total capital costs, limitations on collector sewer eligibility, higher Federal and state shares for alternative facilities, and deferred capital for future on-site systems, local capital was reduced between 89% and 98%.

### b. Performance

In newly sewered areas, particularly around rural lakes, only occasionally is there a realistic quantified assessment of the water quality impact of the on-site treatment to be replaced. Experience in the Seven Rural Lake EIS's suggests that the costs and impacts of sewering may sometimes achieve no discernible water quality improvement, or that reduction of non-point source pollution may produce a much greater water quality improvement at a lower cost.

It is conventional engineering wisdom that centralized wastewater treatment facilities, if properly designed and maintained, will provide more reliable and controllable treatment than on-site or small-scale facilities. There certainly are enough decrepit package aeration plants, weed-infested lagoons, and bubbling on-site systems to support this comparison. However, statistics on the performance of U.S. EPA-funded, recently constructed central treatment plants indicate that the "properly designed and maintained" assumption cannot be taken for granted. An EPA-funded study of treatment plant performance (Energy and Environmental Analysis, Inc., 1978) found that 53% of the plants were in significant or serious violation of their National Pollution Discharge Elimination System permits during the spring of 1977.

The problems that arise with centralized and small waste flows approaches are not the fault of the technologies involved, but result from the ways these technologies are selected, designed, built, and operated--in a word, management. Throwing money into centralized collection and treatment

TABLE I-C-1. ESTIMATED COSTS OF CENTRALIZED AND OPTIMUM OPERATION ALTERNATIVES - SEVEN RURAL LAKE EIS's

| | Crystal Lake, Michigan[1] | Green Lake, Minnesota[2] | Crooked and Pickerel Lakes, Michigan | Steuben Lakes, Indiana | Otter Tail Lake, Minnesota | Salem Utility District No. 2, Wisconsin | Nettle Lake, Ohio | Total |
|---|---|---|---|---|---|---|---|---|
| 1980 Dwelling unit equivalents | 1,384 | 972 | 212 | 4,171 | 1,181 | 1,922 | 464 | 10,306 |
| 20-Year Present Worth ($1,000) | | | | | | | | |
| Centralized | 15,500.2 | 8,411.3 | 3,558.0 | 23,166.8 | 10,358.6 | 15,610.8 | 1,842.5 | |
| Optimum operation | 4,006.2 | 1,786.1 | 1,191.0 | 6,523.7 | 4,763.7 | 8,443.8 | 796.5 | |
| Savings | 11,494 | 6,625.2 | 2,367.0 | 16,643.1 | 5,595.5 | 7,167.0 | 1,046.0 | 50,937.8 |
| 1980 Average Annual Homeowner's Cost[3] ($/yr) | | | | | | | | |
| Centralized | 795 | 247 | 660 | 527 | 427 | 407 | 335 | |
| Optimum operation | 95 | 80 | 124 | 50 | 102 | 170 | 110 | |
| Savings | 700 | 167 | 536 | 477 | 325 | 237 | 225 | |
| Savings per community/ yr ($1,000) | 968.8 | 162.3 | 113.6 | 1,989.6 | 383.8 | 455.5 | 104.4 | 4,178 |
| Local Capital-Initial Year of Operation ($1,000) | | | | | | | | |
| Centralized | 11,816.7 | 1,045.4 | 1,269.8 | 17,100.9 | 4,268.8 | 5,588.1 | 936.5 | |
| Optimum operation | 193.7 | 108.1 | 87.9 | 236.9 | 153.9 | 579.3 | 84.9 | |
| Savings | 11,623.0 | 937.3 | 1,181.9 | 16,864.0 | 4,114.9 | 5,008.8 | 851.6 | 40,581.5 |

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[1] Presently unsewered portion of proposed service area only.

[2] An approximation only. The fully centralized alternative included costs for sewer rehabilitation and treatment capacity for presently sewered areas. Costs attributable to presently sewered areas have been factored out.

[3] "Average annual homeowner's cost" includes one residence's equal share of his community's 1980 debt retirement cost plus 1980 operating expenses plus a reserve fund contribution of 20 percent of his debt retirement share. To this is added an equivalent annual payment for private costs (such as house sewers) as if they were paid at 6-7/8 percent for 30 years. House sewer costs were not included in homeowner's costs in some of the EISs. The amounts shown here for centralized alternatives may, therefore, be higher than in the EISs.

[4] Estimates for optimum operation alternative are hypothetical. A centralized system is presently being constructed with state funding assistance.

[5] Projected alternative.

facilities does not solve the problem of inadequate management. It only creates a need for different management procedures.

### c. Environmental Impact

In many rural and developing communities, installation of sewers will have minor environmental impact. However, the primary and secondary impacts of sewer construction that might occur could outweigh the benefits of centralization.

EIS VI-B-1
VI-B-6
VI-B-7

Primary environmental and social impacts in rural areas occur as results of sewer construction or of the development supported by sewers. Examples are disruption of archaeologic sites, development in floodplains, destruction of wildlife habitat, and increased non-point source pollution.

EIS IV-D

EIS VI-B-2
VI-B-5

Some environmentally sensitive areas are protected from development only by the fact that on-site systems will not operate in them. Sewers can overcome the natural constraints to development in such areas and, in lieu of protective laws and enforcement, may result in permanent environmental damage. In Region V, possibly the most common encroachment of this type is on fresh water wetlands. Steep slopes, vulnerable to erosion, are common in the southern parts of Ohio, Indiana, and Illinois, around many glacial lakes, and in other parts of Region V.

Sewers can overcome these natural constraints resulting in greatly increased erosion and non-point source pollution during both sewer construction and subsequent development in these areas. Elevated rates of erosion and non-point source pollution will continue for the life of the development. In some cases this non-point source pollution can actually offset water quality benefits associated with sewering.

EIS VI-B-3

Other valuable natural resources may be encroached on because of the growth-inducement effects of sewers. Installation of interceptor or collector sewers through sparsely developed or undeveloped tracts provides incentive to develop that land. This effect is enhanced when municipalities must actively encourage development in order to pay off debts incurred in financing the sewers. Of particular concern in Region V is such encroachment on prime agricultural lands.

TRD XI

While these impacts are not unique to sewer construction, they commonly are caused by it. Careful planning and implementation of mitigating measures, including not building the sewers, must be considered when sensitive or valuable resources are present

## 3. POTENTIAL SAVINGS

EIS I-C-4

The monetary savings that can result from small waste flows management were summarized above for the seven rural lake communities previously studied by U.S. EPA Region V. For the six projects that may be implemented as recommended, present worth savings totaled approximately $44 million or $5,220 per dwelling unit. There are, perhaps, 80,000 additional dwellings in unsewered lake communities for which Construction Grants activities are planned or in progress based on a review of Region V's project files. If the same cost savings can be achieved for these dwellings as are possible in the six EIS communities, the total regional present worth savings for lake projects funded through 1985 could be as high as $460 million.

TRD X-A

TRD X-E

The Seven Rural Lake EIS's considered a total of 10,306 dwelling unit equivalents presently served by on-site systems. There are approximately 3.3 million on-site systems in Region V. Not all of these, of course, require improved management or upgraded systems. Even fewer are so densely located that sewering would even be considered. In order to derive an order-of-magnitude estimate for potential savings resulting from optimum operation, the following five steps were taken:

1. The number of residential on-site systems in the Region was estimated for three categories:

   - urban = 536,300
   - rural non-farm = 2,036,600
   - rural farm = 759,300

   3,332,200

2. It was assumed that a negligible part of the rural farm systems would require either optimum operation or sewering. This leaves a total of 2,572,900 systems.

3. For the urban and rural non-farm categories, the systems were allocated to density groups of <25, 25-50, 50-75, 75-100, and 100+ dwellings per mile of potential collection sewer. Depending on lot configuration and development pattern, average lot sizes would range from eight acres down to one-quarter acre for the range of densities considered.

4. The total (urban plus rural non-farm) number of residences within each density group was partitioned into need classes:

   - sewer,
   - sewer or optimum operation,
   - optimum operation,
   - no action.

5. Present worth costs for sewering were compared to the present worth costs of optimum operation for the second need class: sewer or optimum operation.

The nominal present worth savings within Region V, estimated by this procedure, is $1.9 billion. This represents an average $4,436 savings per dwelling for the 430 thousand dwellings estimated to be in the "sewer or optimum operation" needs class. This needs class, as estimated, is 13% of all on-site systems in the Region and 17% of non-farm on-site systems.

TRD X-E

The estimates summarized here are presented in more detail in Technical Reference Document Chapter X-E, "On-site Systems in Region V and Potential Cost Avoidance from Adoption of Optimum Operation Alternatives."

The reader should recognize that this estimate is dependent on assumptions in Steps 3 through 5 which cannot at present be fully verified with hard data. It is felt, however, that possible errors in these assumptions will not have as much effect on the estimate as will external factors, especially local and state initiatives, or the lack thereof, to improve rural sanitation.

## 4. NUMBER OF POTENTIAL RURAL AND RURAL LAKE PROJECTS IN REGION V

TRD X-A

Specific terms are applied to the various sized communities discussed in this section. A "small community" as used here is any place with a population of 10,000 or less. A "place" may be unincorporated or incorporated. Unincorporated places are defined as closely settled population centers that have no corporate boundaries, contain a population of at least 1,000, and have a definite nucleus of residences (U.S. Bureau of the Census, 1978). In Region V states, incorporated places include cities, towns, and villages.

The Bureau of the Census defines "urban population" as all persons living in places of 2,500 population or more, or in specifically defined, urban areas in and surrounding cities of 50,000 or more population. "Rural population" is everyone else.

Unsewered development certainly exists in some urban places of over 10,000 population. If proposed for Construction Grants funding of collector sewers, such areas will have to meet the same criteria as unsewered parts of smaller communities. However, this is unlikely to be the major focus of facilities planning in large communities. When estimating potential numbers of facilities plans, the focus is on communities of less than 10,000 since relatively larger proportions of their areas will be unsewered.

Figure I-C-2 shows by 2,500 population size brackets the total number of places less than 10,000 population in Region V as of 1977. Any of these places, plus an unknown number of smaller settlements that do not qualify as places, may benefit from adoption of the wastewater management approach described here.

Figure I-C-2 also shows the number of approved user charge systems and total number of applications in process or on priority lists. User charge systems are normally submitted to U.S. EPA near the end of Step 3 in the Construction Grants process. This is a fairly accurate estimate of the number of communities that have completed construction of wastewater facilities.

TRD X-A The next block in each size bracket includes number of projects that are on the states' 5-year priority lists (1980-1985) or are receiving funds for Steps 1, 2, or 3. A single user charge system or project may cover only a part of a place or may include more than one place. The degree of overlap is not known. Table I-C-2 shows the number of small community projects on priority lists or receiving Grant funds by state and by community size and shows the estimated number of lake projects by state.

The remaining places may be placed on state priority lists after 1985. Potential post-1985 candidates far outnumber small communities already involved in the Construction Grants process. The majority, 89%, are rural places of less than 2,500 population.

The number of places on priority lists or designated as potential candidates is large but will be reduced to an unknown extent because many communities can manage their wastewater facilities without Federal grant assistance. This is an ultimate objective of the Construction Grants program, and, to the degree that communities are already managing on their own, the program will succeed that much more quickly.

The number of future projects can be reduced further by joint applications from several small communities. In addition to reducing administration time and costs, this would also provide desirable economies of scale in small waste flows management and manpower costs.

## 5. LACK OF INFORMATION ON SMALL SYSTEM PERFORMANCE AND COSTS

The low amount and quality of information about on-site systems is a reflection of existing management of such systems. The public interest in adequate performance has traditionally been outweighed by the desire of individuals for privacy. As a result, on-site systems are seldom inspected after construction, and community-wide surveys are nearly nonexistent. Community surveys generally are not encouraged or funded unless an epidemic or an absolutely unacceptable failure rate already exists. The result is a very bad reputation and a body of literature that primarily reports the worst cases.

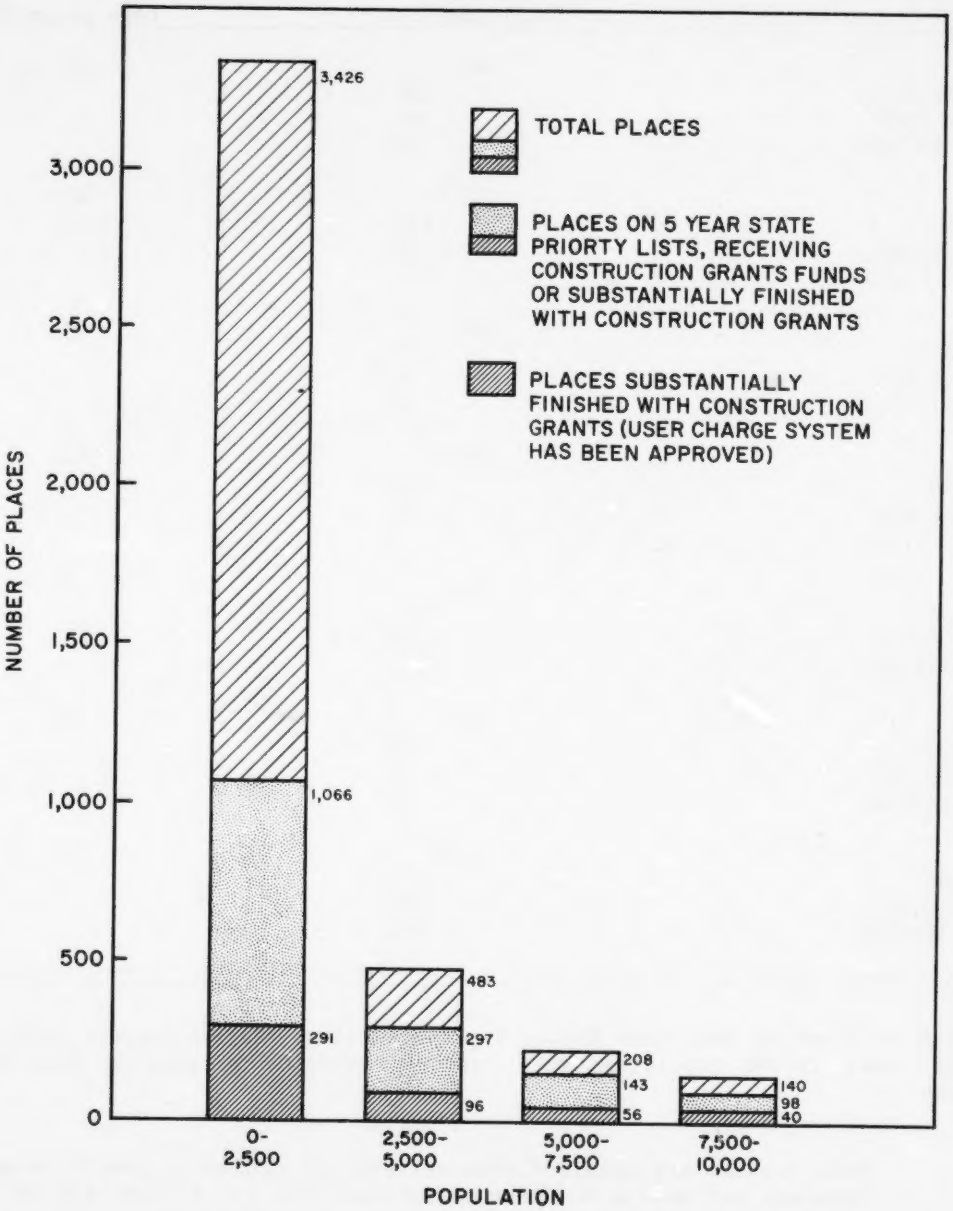

FIGURE I-C-2. INVOLVEMENT OF SMALL COMMUNITIES IN THE CONSTRUCTION GRANTS PROGRAM

TABLE I-C-2. ESTIMATED TOTAL SMALL COMMUNITY PROJECTS AND RURAL LAKE PROJECTS U.S. EPA REGION V - 1980 - 1985*

| State | Total projects | Lake projects |
|---|---|---|
| Illinois | 240 | 48 |
| 0-2,500 | 156 | |
| 2,501-5,000 | 48 | |
| 5,001-10,000 | 36 | |
| Indiana | 177 | 40 |
| 0-2,500 | 117 | |
| 2,501-5,000 | 29 | |
| 5,001-10,000 | 31 | |
| Michigan | 122 | 68 |
| 0-2,500 | 66 | |
| 2,501-5,000 | 29 | |
| 5,001-10,000 | 27 | |
| Minnesota | 276 | 120 |
| 0-2,500 | 232 | |
| 2,501-5,000 | 35 | |
| 5,001-10,000 | 9 | |
| Ohio | 143 | 8 |
| 0-2,500 | 76 | |
| 2,501-5,000 | 36 | |
| 5,000-10,000 | 31 | |
| Wisconsin | 163 | 88 |
| 0-2,500 | 128 | |
| 2,501-5,000 | 24 | |
| 5,001-10,000 | 11 | |
| Region V | 1,121 | 372 |
| 0-2,500 | 775 | |
| 2,501-5,000 | 201 | |
| 5,001-10,000 | 145 | |

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* The table is based on data from Region V project files. 25% of project files for communities under 10,000 population were randomly selected to provide data for these estimates.

What results are obtained when surveys are conducted just to monitor performance and not to document situations that are already out of hand? In many cases, such as Fairfax County, Virginia, Glastonbury, Connecticut, and the Seven Rural Lake communities, performance has been much better than is usually expected.

Considerable discrepancy exists between perceived performance and documented performance. Two possible sources of bias are the homeowner's perspective and the sanitarian's perspective. Although homeowners seldom err by reporting failures that have not occurred, they do, either knowingly or out of ignorance, fail to report problems during surveys or censuses. The level of underreporting is never quantified. In contrast to homeowners, sanitarians, engineers and municipal officials are professionally concerned with failures for various reasons and tend to overemphasize their prevalence and significance. Consider, for instance, the effects on a sanitarian's attitude toward installed systems when he is asked to inspect only failing systems. His negative attitude toward the failing systems, the other systems he has permitted, and all the ones he must permit in the future, is amplified by the personal hardship and inconvenience of the owners, and by the implied or open recriminations that owners heap on the sanitarian. Municipal officials also do not hear about the systems that work; they hear about the few that do not work. As evidenced by facilities plans prepared for the communities studied in the Seven Rural Lake EIS's, engineers uncritically accept opinion and fragmentary data regarding on-site system performance.

EIS II-A-2

On-site system failure rates undoubtably vary greatly from community to community. The Seven Rural Lake EIS's showed that failure rates are not directly predictable from site suitability criteria such as lot size, depth to groundwater and soil type. The EIS's showed that lake shores, a setting conventionally thought to be very sensitive to septic tank systems, do not, in fact, have unusually high failure rates.

EIS II-A-3-c

Community-wide performance data is almost always lacking and surveys that have been conducted indicate a much lower failure rate than predicted from site limitations, yet there are suspected sources of bias from the two groups closest to the problem; homeowners and sanitarians. At the same time, large sums of money may be needlessly spent if valid performance data is lacking or if site suitability is erroneously evaluated. This situation demands the collection and objective analysis of performance data and corollary information such as design, usage, maintenance, soils, site constraints, groundwater hydrology, and surface drainage.

Other types of information are also lacking. Many technology and management alternatives discussed in this EIS have not been extensively applied and evaluated. Cost data, while based on a great deal of literature and direct quotes, have rarely been confirmed in small waste flows projects on a community scale.

If on-site systems are as hazardous as many responsible people believe, and if appropriate management can in many cases control problems of on-site systems with sizable cost savings, answering these questions about performance, costs, and management not only would be justified in the name of public health and welfare, but also could save billions of dollars.

## 6. IMPACTS OF ON-SITE SYSTEMS

TRD XII

The high cost of sewering requires that any decision to sewer takes into account the actual quantitative role of existing systems in water quality problems. An informed decision requires evaluation of pollution sources beside wastewater, the cost of reducing or ending these other sources, and the comparative speed with which wastewater and other pollution sources can be abated. Existing systems are by no means the only cause of water pollution.

Consider, for example, well contamination. When an on-site well exhibits indicator bacteria, septic tanks and drainfields are the prime suspects. For local officials documenting the need for new wastewater or water supply facilities, they are often the only suspects. But hasty conclusions can result in expensive measures that do not solve the actual cause of contamination. In many cases, poor design or poor condition of the well itself allows surface runoff into the well.

Similarly, on-site systems may be suspected of increasing phosphorus contributions to lakes, thus hastening eutrophication. There is evidence that septic leachate can stimulate plant growth near the point where the leachate plume enters a lake. This impact can be pronounced on very small lakes or embayments with still waters and many shoreline dwellings. However, on larger bodies of water, wave action seems to control such local plant growth. Lacking demonstrated bacterial contamination from these plumes, the impact of concern is phosphorus loading to the lake as a whole. Phosphorus control strategies that include agricultural, silvicultural, horticultural, and urban non-point source controls may potentially be more cost-effective than elimination of on-site systems. TRD II-G

TRD II-A On-site systems are not always harmless. Their very proximity to human dwellings amplifies the importance of their small flows and limited adverse impact. It is most important, however, that decisions about their water quality and public health problems be based on actual performance and not opinion.

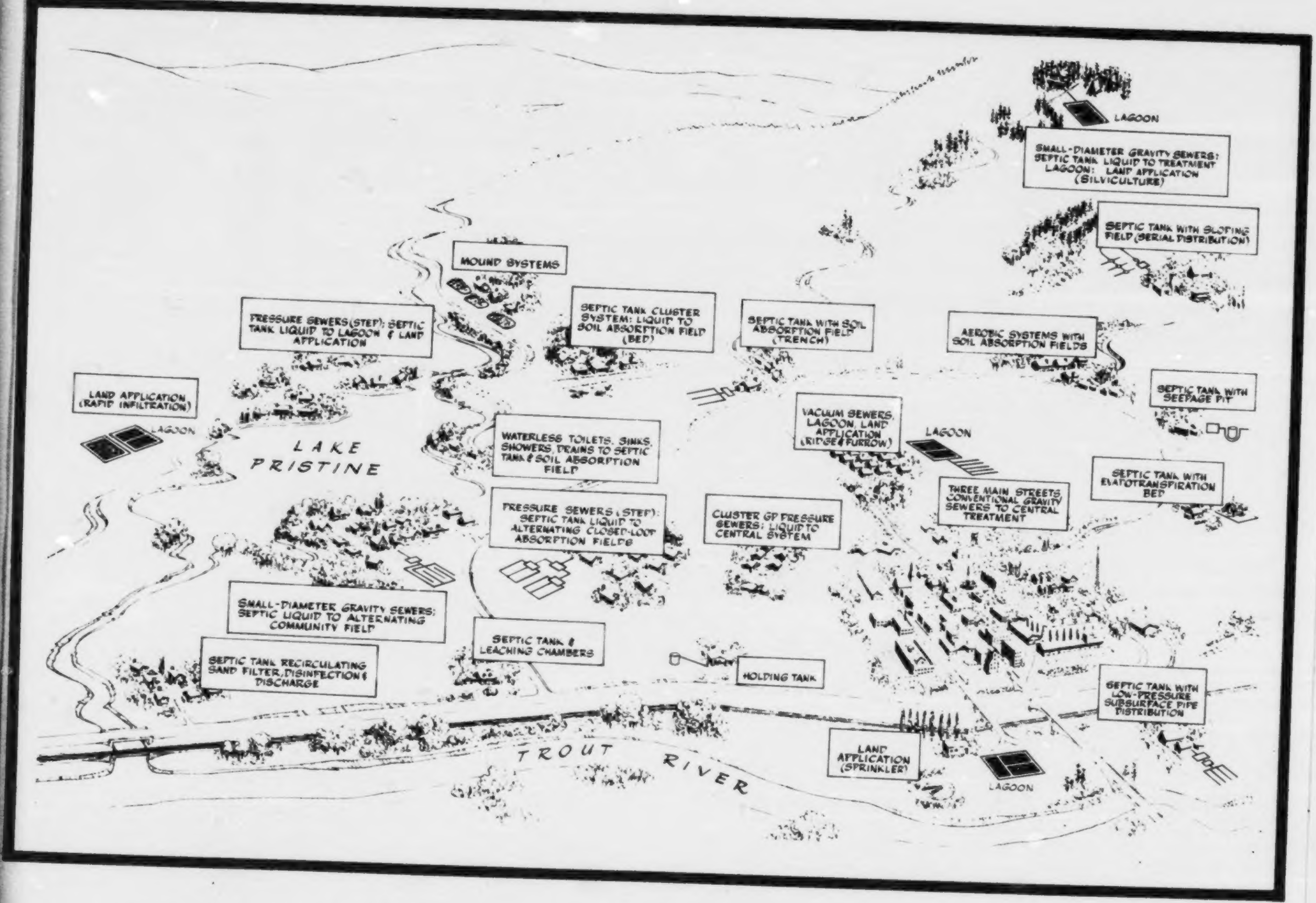
## 7. TWO LEVELS OF NEED FOR ACTION

The environmental and economic reasons for seriously considering optimum operation alternatives have been briefly mentioned previously. More specific information on the needs and methods to address them are presented in greater detail in the remainder of this EIS and in the supporting Technical Reference Document.

The recommendation to evaluate optimum operation alternatives generates secondary needs such as the need for improved data collection as noted. Most of the proposed actions, in fact, respond to these secondary needs, the needs that must be met to achieve the environmental and economic benefits of optimum operation: public participation, community supervision, state initiatives, facilities planning methodologies, and mitigating measures.

# Chapter II

# Small Waste Flows Technologies


LAGOON
SMALL-DIAMETER GRAVITY SEWERS: SEPTIC TANK LIQUID TO TREATMENT LAGOON: LAND APPLICATION (SILVICULTURE)
SEPTIC TANK WITH SLOPING FIELD (SERIAL DISTRIBUTION)
MOUND SYSTEMS
PRESSURE SEWERS (STEP): SEPTIC TANK LIQUID TO LAGOON & LAND APPLICATION
SEPTIC TANK CLUSTER SYSTEM: LIQUID TO SOIL ABSORPTION FIELD (BED)
SEPTIC TANK WITH SOIL ABSORPTION FIELD (TRENCH)
AEROBIC SYSTEMS WITH SOIL ABSORPTION FIELDS
LAND APPLICATION (RAPID INFILTRATION)
LAGOON
SEPTIC TANK WITH SEEPAGE PIT
LAKE PRISTINE
WATERLESS TOILETS, SINKS, SHOWERS, DRAINS TO SEPTIC TANK & SOIL ABSORPTION FIELD
VACUUM SEWERS, LAGOON, LAND APPLICATION (RIDGE & FURROW)
LAGOON
SEPTIC TANK WITH EVAPOTRANSPIRATION BED
THREE MAIN STREETS CONVENTIONAL GRAVITY SEWERS TO CENTRAL TREATMENT
PRESSURE SEWERS (STEP): SEPTIC TANK LIQUID TO ALTERNATING CLOSED-LOOP ABSORPTION FIELDS
CLUSTER OF PRESSURE SEWERS: LIQUID TO CENTRAL SYSTEM
SMALL-DIAMETER GRAVITY SEWERS: SEPTIC LIQUID TO ALTERNATING COMMUNITY FIELD
SEPTIC TANK & LEACHING CHAMBERS
SEPTIC TANK RECIRCULATING SAND FILTER, DISINFECTION & DISCHARGE
HOLDING TANK
SEPTIC TANK WITH LOW-PRESSURE SUBSURFACE PIPE DISTRIBUTION
TROUT RIVER
LAND APPLICATION (SPRINKLER)
LAGOON

THE SMALL COMMUNITY AND TYPICAL USES OF ALTERNATIVE WASTEWATER SYSTEMS

# CHAPTER II

# SMALL WASTE FLOWS TECHNOLOGIES

## A. ON-SITE SYSTEMS

### 1. ON-SITE SYSTEMS IN REGION V

TRD X-E In the six states of U.S. EPA Region V, approximately 3.3 million on-site wastewater treatment systems were in place in 1979. These systems served approximately 22% of the population in the Region, ranging from 4% of urban residents (places greater than 2500 population), to 66% of rural non-farm residents, and 99% of farm residents. The predominant type of on-site system is the septic tank-soil absorption system. Cesspools are also common in this area but typically serve only buildings that are more than 20 years old. Of all the on-site systems in Region V, 3.2 million or 95% are either septic tank-soil absorption systems or cesspools. The remaining systems are chemical toilets or pit privies.

There are great variations in design, construction and quality of these systems. These have been caused in part by the early absence of regulatory codes, continuing changes in them, and a frequent lack of enforcement. Together these have made possible the occasional treatment atrocity: direct untreated discharge of lakes, 55 gallon drums with axe holes, or buried automobiles. More recently installed systems include advanced treatment technologies, such as mounds, shallow placement, dosing, and electro-osmosis.

When septic tanks systems were beginning to replace pit privies, few local jurisdictions had standards for siting, designing, installing, and operating septic tank systems. As knowledge of these systems increased and early systems failed, regulatory codes were developed. These codes have changed through the years as experience and research have dictated. As a result, older systems do not satisfy existing codes.

Regardless of the standards in effect at the time of construction, some septic tank-soil absorption systems will eventually fail. Factors that contribute to the failure of on-site systems are discussed in the following section.

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Legend for Cross-references in Margins

| | |
|---|---|
| EIS I-C-2 | Section of this EIS |
| TRD II-A | Section of the Technical Reference Document published separately |
| CWA 201(g)(1) | Section of the Clean Water Act which necessitates change in the text |
| 40 CFR 35.2110 | Section of the Construction Grants regulations which necessitates change in the text |
| CG 82-6.2. | Section of the program guidance document, Construction Grants - 1982, upon which change was based. |
| C.26. | Comment on the Draft EIS relevant to topic discussed (see Chapter VII) |

All significant changes from the Draft except new sections are identified by underlining.

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## 2. FAILURES OF ON-SITE SYSTEMS

### a. Types of Failures

Failures of on-site systems that are significant enough to warrant public funding for abatement include:

- direct discharges,
- surface malfunctions,
- backups into the household plumbing, and
- contamination of groundwater at an actual or potential point of use.

Direct discharge of raw domestic wastewater or septic tank effluent to the ground surface, to drainage ditches or to waterways is not a system failure as such, but lack of a system, and not accepted practice. Depending on the source of wastewater, direct discharges can pose the most severe public health and water quality impacts of all types of failure due to the absence of any treatment by soil or other effective methods. Because of the threat and difficulties of monitoring, health authorities generally ban direct discharges whether the discharge contains human waste or just kitchen or laundry waste. Abatement of direct discharges by cost-effective means will generally be expected in a community receiving Construction Grants aid. However, individual exceptions may be justified where the wastewater source or the conditions under which it is discharged create minor impacts and the cost of abatement is unreasonable.

Surface malfunctions of soil absorption systems typically are due to inadequate hydraulic capacity. Wastewater flows in excess of design, soil clogging, impermeable soils, and pipe clogging or collapse can contribute to this type of failure. Surface malfunctions can range from seasonal dampness of the ground to short-circuiting of the soil absorption systems through channels eroded through the soil. Although a minor malfunction is often the precursor of more severe problems, this is not always the case. Intermittent surface malfunctions or "weeping" of mound systems may occur for long periods without creating anything more than a nuisance. Such minor surface malfunctions may be included in failure statistics when estimating facilities required for optimum operation alternatives in facilities planning. However, later decisions to abandon such on-site systems should be supported by information regarding the severity of the problem and the feasibility of other remedies.

Backups in household plumbing can be caused by any of the factors that cause surface malfunctions. In addition, clogging of the plumbing itself will also cause backups. As contrasted to the other types of malfunctions, the only way to quantify backups is by interview with residents. Residents' descriptions of the frequency of backups may be the basis for a preliminary diagnosis. Non-recurring backups or backups that were remedied by plumbing maintenance should not be considered as system failures. However, on some sites, plumbing backups may be the only evidence of inadequacy in the on-site system.

EIS IV-E-1
VI-A-1

Contamination of groundwater is at once the most difficult failure on which to obtain reliable data, and the one with the most severe potential public health impacts. Virtually all standard soil absorption systems and many alternative on-site technologies discharge to groundwater, thereby contaminating it to some degree. Whether the contamination is significant, however, depends on the use of the affected groundwater, the contaminants discharged, and their concentrations at points of use.

"Points of use" include:

- for unconfined aquifers, all locations around an on-site system beyond the state's minimum separation distance to wells,

- for confined aquifers, the same except that perched groundwater tables with no aquifer potential are not points of use,
- any existing water supply well, and
- zones of groundwater discharge to primary contact surface waters or to surface waters used for drinking water.

Where local sampling indicates that drinking water standards are exceeded at distances greater than states' mimimum separation distances, then locally applicable separation distances should be incorporated into this definition.

For aquifers and wells, traditional contaminants of concern are bacterial pathogen indicators (total or fecal coliform bacteria) and nitrates. Failures of individual wells do not indicate wholesale contamination of the source aquifer.

Water quality standards for untreated drinking water are well established, but standards for groundwater discharges to surface waters are not. Sooner or later, the states in Region V will need to develop such standards.

### b. Frequencies of Failures

Reliable data on the various types of failure are very scarce. Most locales have neither surveys nor more specific analysis of on-site system performance. Health department complaint and repair records are usually the only data available. Such information would be useful, but it is seldom compiled, analyzed or published. While there is no comprehensive information on the subject, some data exist to broadly describe frequencies of on-site system failures. The failure most likely to be noticed by residents, and, therefore, the one most likely to be reported during a survey, is a plumbing backup.

The 1977 Census of Housing (U.S. Department of Commerce, 1979) reports that 1.6% of surveyed occupants in the north central United States served by on-site systems reported breakdowns where the systems were unusable one or more times for six consecutive hours or longer during the 90-day period preceding the survey. These breakdowns included not only system failures but also clogged pipes and failures of the water supplies.

By contrast, occupants served by public sewer reported an 0.8% breakdown rate. For on-site systems, reported breakdowns were highest in urban areas, 2.8%, lowest on farms, 1.0%, and the same as the overall on-site breakdown rate in rural, non-farm dwelling, 1.6%. (It is also interesting to note that the water supply failure rate, 2.5%, and the flush toilet failure rate due to problems inside the building, 1.6%, were higher than the combined sewer/on-site sewage disposal failure rate of 1.0%.)

Sanitary surveys conducted for the Seven Rural Lake EISs indicated that recurrent backups were more frequent in the five communities surveyed than the census region's average (Peters and Krause, 1980). Rates varied from 2% to 20%. In all five communities the recurrent backup rates were higher than the rates of surface malfunction, which ranged from 0% to 8%.

Reports on failures of on-site systems seldom specify the type. It is suspected, however, that "failure" most often refers to surface malfunctions. Surface malfunctions present the greatest nuisance to neighbors, and are usually more identifiable than direct discharges, which tend to be well concealed. Surface malfunction rates are best quantified by aerial survey or on-site sanitary inspection. This information is not yet widely available. The next best source of data for surface malfunctions is probably public health department complaint and repair records.

In support of an EIS on mound systems, Wisconsin Department of Health and Social Services (1979) cites a 1967 survey of eight lake areas. The percent of dwellings with sewage discharges to the ground surface ranged from 3.7 to 44% with an average of 14.6%. It is not stated to what extent the survey areas were selected based on previously recognized problems. Combined with direct discharges, the total "failure" rate was 22%. There is a gross discrepancy between these figures and the rate of issuance for repair permits. The EIS states that approximately 2042 repair permits were issued in 1975 within 66 of the state's 72 counties. This is only 0.45% of the on-site systems that the EIS estimated to be in place then. This discrepancy strongly suggests that:

- Failure rates vary widely from one locale to another. While the state or regional rates may be low, specific communities or parts of communities may have substantially higher than average rates.
- Many failures remain undetected and unrepaired. The traditionally passive role that local health officials take in regard to on-site system performance likely results in underestimation of even the easily detectable failures.
- Depending on the length of time failures are allowed to persist, one-time surveys probably count more failures than actually start in any given year. Use of survey statistics to estimate an annual failure rate is not, therefore, justified in most instances. At the same time, the survey statistics probably do not reflect a cumulative failure rate since some proportion of past failures will have been repaired.

Failure rates for groundwater contamination by on-site systems are, and will continue to be, uncertain. However, in contrast to the other types of failures for which little epidemiological evidence exists linking them with actual public health problems, groundwater contamination by on-site systems is a recognized source of disease. Keswick and Gerba (1980) cite Craun's data (1979) that 42% of the 264 outbreaks of waterborne disease between 1946 and 1977 were due to "overflow from septic tanks and cesspools..." Many unreported illnesses no doubt occur and are not investigated because too few people are involved to indicate the source of pathogens. Woodward et al (1961) report nitrate concentrations in water wells in 39 Minnesota unsewered villages and metropolitan suburbs. 47.5% (30,000) of 63,000 wells showed significant concentrations of nitrate. 10.6% exceeded the drinking water quality standard of 10 mg/l $NO_3$-N. Other studies document additional examples of aquifer contamination by on-site systems.

In most of the groundwater studies, however, the areas were densely developed and/or were underlain by channeled or fissured bedrock. Thus, while it is known that serious groundwater problems can be caused by on-site systems, there is usually no way to assess the potential locally other than by sampling programs.

## c. Causes of Surface Failures and Plumbing Backups

EIS I-B-1

Causes of surface failures and backup problems for existing systems can be divided into two categories: those easy to control and those more difficult (or impossible) to control. Those easy to control include:

- system usage,
- maintenance, and
- surface drainage.

System usage includes number of occupants, daily per capita flow, and use of garbage disposals. These can be controlled by installing water meters and flow reduction devices, limiting occupancy, and prohibiting garbage disposals. Maintenance problems can be controlled by 1) a renewable permit system contingent upon proof of periodic inspection and maintenance, 2) public maintenance services, 3) required maintenance contracts, or 4) public education. Surface drainage problems can be controlled by diverting runoff away from on-site systems, disconnecting roof and foundations drains, or mounding soil over soil absorption systems.

Causes of surface failures and plumbing backups that are more difficult to control include:

- system design,
- soil characteristics,
- site characteristics (size and shape of lot, relationship to other lots, relative location of house and well),
- groundwater hydrology, and
- system age.

Most of these can be controlled by a major modification to the existing system. Examples of possible controls include: upgrading or expanding the system, changing the system design, using a different area of the lot, transporting wastewater off-site for treatment, and installing artificial drains.

### d. Factors Contributing to Failures Resulting in Groundwater Contamination

Groundwater contamination from on-site systems is usually due to some type of soil or geological characteristic. Examples of such include very permeable sand layers, creviced limestone, or other formation that allows partially treated effluent to bypass soil layers and enter the groundwater. Controls for these types of failures are limited to alternative designs, such as mounds, that overcome the particular limitations to on-site treatment and to changing the characteristics of wastewater such as reducing nitrogen loads with composting toilets or off-site disposal of toilet wastes.

### e. Effects of Failures

TRD II-A The most important effect of on-site system failure is contamination of water supplies. Pollutants from failing on-site systems can enter surface waters from groundwater plumes or when storm water runoff washes ponded effluent into the water body. Detrimental effects of contaminated surface waters include slightly increased algal growth and, more important, contamination of drinking water supplies. High levels of bacteria, viruses, and nitrates in drinking water can cause various types of disease and illness.

Another effect is the nuisance that results from effluent ponding. This is more noticeable in areas of higher density or when the absorption system is close to residences.

## 3. AVAILABLE ALTERNATIVE ON-SITE OPTIONS

### a. For Overcoming Site Limitations

TRD I Table II-A-1 lists dozens of options for on-site facilities that may be considered for the specific site limitations or constraints given. These can be considered for replacing, upgrading, or repairing failing on-site facilities or for construction of systems for new buildings. (U.S. EPA, 1980b; U.S. EPA, 1980c).

### b. For Existing Systems Not in Compliance with Codes

TRD VII-A Existing systems not complying with current regulatory codes should be investigated to determine their performance. The investigation should

TABLE II-A-1. ON-SITE WASTEWATER MANAGEMENT OPTIONS FOR SPECIFIC LIMITATIONS FOR CONSTRAINTS

| Limitation/constraint | On-site option |
|---|---|
| None | Conventional septic tank/soil absorption system |
| High groundwater or shallow depth to bedrock | Elevated sand mounds<br>Shallow placement system<br>Evapotranspiration system<br>Artificial drainage<br>Buried sand filters |
| Slowly permeable soil | Oversized soil absorption system<br>Seepage pits<br>Electro-osmosis<br>Pressure distribution<br>Evapotranspiration system |
| Hydraulic, organic, or soilds overload | Flow reduction<br>Waste stream segregation; chemical biological, or incineration toilets<br>Multiple septic tansk or chambers<br>Septic solids retainer<br>Septic tank baffles<br>Large diameter tubing |
| Grease or scum clogging | Grease trap<br>Septic tank baffles |
| Clogging of absorption field | Alternating drainfields $H_2O_2$ treatment<br>Septic tank baffles<br>Multiple septic tanks or chambers<br>Gravity or mechanical dosing |
| Highly permeable soil | Pressure distribution<br>Oversized soil absorption systems |
| Sloped site | Serial distribution |
| Subsurface disposal not possible (for example, rock outcrops, floodplains, steep slopes) | Discharging Options:<br>fixed film reactors, intermittent or recirculating sand filters, lagoons, aerobic unit<br>Disinfection Options:<br>Sodium or calcium hypochlorite, iodine, ultraviolet light, ozone |

EIS III-E
II-D-3

determine if any system failures such as plumbing backups, surface ponding, or groundwater contamination have occurred. If the investigation concludes that no significant past malfunctions have occurred and the likelihood of future system failure is small, the subcode system should not be upgraded just to comply with the regulations. The intent of the code is to prevent groundwater contamination and other public health problems. If this intent is being met (even with a "sub-standard" system), the cost to upgrade the system would not be justified. Records of such investigations should be made and stored so that, if and when the systems fail, the upgrade can be designed without completely repeating the investigations.

### c. Use of Soils Data

TRD III-A

Of the several factors that determine on-site system performance, soil characteristics are most amenable to evaluation prior to issuance of construction permits. Regulatory agencies justifiably consider evaluation of soil characteristics to be a key element in on-site system management.

EIS II-D-1

Soil characteristics can be used along with other information to explain the performance of existing on-site sewage disposal systems and to predict the performance of future systems. Explanations and predictions may be based on either hypothetical or empirical relationships between soil characteristics and system performance. An example of a hypothetical relationship is correlation of percolation rates with surface malfunctions, e.g., malfunctions can be expected in soils with rates greater than 60 minutes per inch. An example of an empirical relationship is the survey result that 45 out of 100 on-site systems in slowly permeable soils are failing, that the soils for 40 of the 45 are also poorly drained, and that 4 out of the 5 remaining systems receive very high seasonal use.

Reliance on hypothetical relationships is appropriate for planning-level decisions and, where supported by on-site soil inspection, for site-specific decisions on undeveloped properties. On-site system design codes and U.S. Soil Conservation Service soil limitation ratings are examples of accepted use of hypothetical relationships. Design codes typically incorporate soil criteria such as percolation rate, depth to groundwater, and depth to bedrock to guide decisions to allow or reject applications to install on-site systems. U.S. Soil Conservation Service soil limitation ratings rely on a comprehensive list of hypothetical relationships to classify specific soils as having slight, moderate, or severe limitations for on-site systems.

The U.S. Soil Conservation Service is improving the use of hypothetical relationships by developing and evaluating soil potential ratings. In contrast to soil limitation ratings, soil potential ratings consider the feasibility and cost-effectiveness of techniques that may overcome unfavorable site characteristics.

Site-specific decisions to abandon or continue to use existing on-site systems need not rely on hypothetical relationships. Performance and the factors, including soil characteristics, that determine performance can be directly measured. This empirical information may or may not confirm accepted hypothetical relationships. It may indicate that factors other than soil characteristics determine on-site system performance.

Collected at a sufficient number of sites and analyzed for locally distinctive trends, data on performance and the factors that affect it will provide a factual basis for making cost-effective decisions for both existing and, at local option, future on-site systems. The policies and procedures recommended in this EIS emphasize reliance on empirical information for decisions on the disposition of existing on-site systems.

## 4. SITE ANALYSIS AND TECHNOLOGY SELECTION FOR INDIVIDUAL PROPERTIES

TRD II-J

EIS II-D-1

In communities served by on-site systems, problems with existing systems must be identified and appropriate remedies sought. A systematic approach to evaluating individual on-site systems, determining causes of failures, and selecting the appropriate technology to correct failures is presented in Figure II-A-1. The decision flow diagram is divided into the following sections: 1) available data review and community surveys, 2) on-site sanitary inspection, 3) identification of problem, 4) detailed site analysis, and 5) technology selection.

The first step includes reviewing existing or easily obtainable data (for more detail see description of Phase I needs documentation studies in Appendix A, Region V Guidance--Site-Specific Needs Determination and Alternative Plannning for Unsewered Areas and the needs documentation flow chart, Figure II-C-2). Data for this step can usually be obtained without going on-site and are useful for preliminary identification of problems.

The on-site sanitary inspection involves talking with individual homeowners about their on-site systems and inspecting their property. The information generated is useful for identifying problems with individual systems. After specific problems are identified, the detailed site analysis section of the decision flow diagram suggests various tests and inspections to determine the source of the problem and to provide enough background information to select the most appropriate technology.

The decision flow diagram provides for systems that do not meet current codes. A septic tank slightly smaller than current requirements need not be replaced if it is in satisfactory condition and working well.

The decision flow diagram cannot account for all situations that may be encountered in the field and should, therefore, be used as a guide along with common sense to determine a specific solution for each on-site wastewater treatment system problem. The intent of the decision flow diagram is to show that specific evaluation procedures beyond the on-site sanitary inspection are not required on every lot. Procedures, especially expensive ones in the detailed site analysis, should be performed only when justified by previous findings.

CWA 201 (1)(1)

This decision flow diagram is appropriate for single properties. Following this diagram for all developed properties in a community could result in waste of time and money where centralized solutions prove to be cost-effective. To prevent this waste, sequencing of needs documentation work with increasingly specific alternative development steps on a community-wide basis is recommended. A subsequent process diagram (Figure II-C-2) shows a possible sequence of these activities for a complex planning situation.

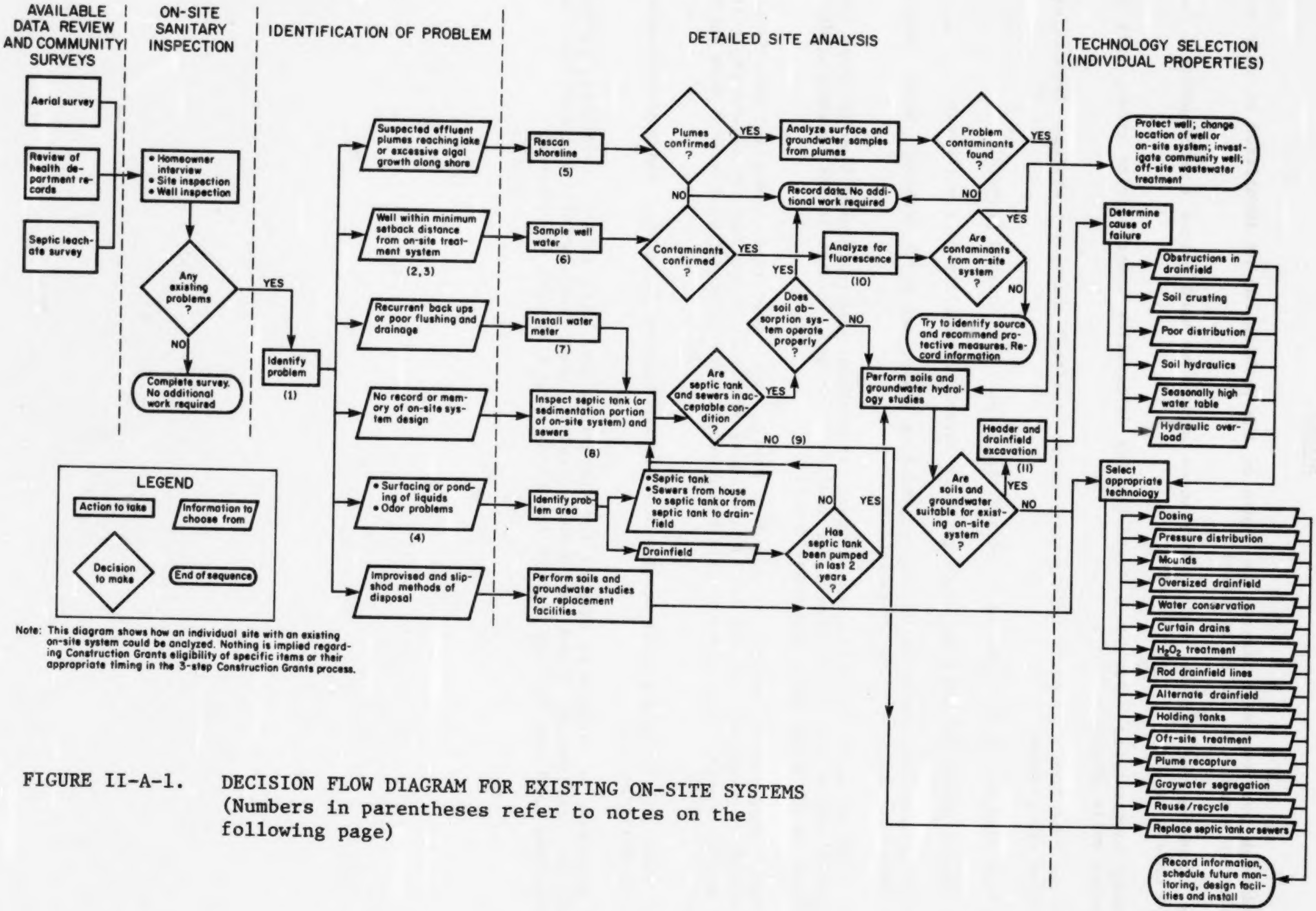
## 5. OPTIONS FOR THE DIFFICULT SYSTEM

TRD I

EIS VI-E-2

Some on-site wastewater problems are harder to solve than others. An isolated section of a community with very low density might have severe site limitations resulting in high failure rates. Sewering is not economically feasible and alternative on-site options are limited. In such cases, consideration should be given to one or more of these technologies:

- flow reduction,
- water metering,
- segregation of wastes,
- reuse/recycle,
- holding tanks, or
- effluent plume recovery.


AVAILABLE DATA REVIEW AND COMMUNITY SURVEYS
ON-SITE SANITARY INSPECTION
IDENTIFICATION OF PROBLEM
DETAILED SITE ANALYSIS
TECHNOLOGY SELECTION (INDIVIDUAL PROPERTIES)
Aerial survey
Review of health department records
Septic leachate survey
• Homeowner interview
• Site inspection
• Well inspection
Any existing problems ?
YES
NO
Complete survey. No additional work required
Identify problem
(1)
Suspected effluent plumes reaching lake or excessive algal growth along shore
Well within minimum setback distance from on-site treatment system
(2,3)
Recurrent back ups or poor flushing and drainage
No record or memory of on-site system design
• Surfacing or ponding of liquids
• Odor problems
(4)
Improvised and slipshod methods of disposal
Rescan shoreline
(5)
Sample well water
(6)
Install water meter
(7)
Inspect septic tank (or sedimentation portion of on-site system) and sewers
(8)
Identify problem area
Perform soils and groundwater studies for replacement facilities
Plumes confirmed ?
YES
NO
Contaminants confirmed ?
YES
Analyze surface and groundwater samples from plumes
Record data. No additional work required
Analyze for fluorescence
(10)
Does soil absorption system operate properly ?
YES
NO
Are septic tank and sewers in acceptable condition ?
YES
NO (9)
• Septic tank
• Sewers from house to septic tank or from septic tank to drainfield
Drainfield
Has septic tank been pumped in last 2 years ?
NO
YES
Problem contaminants found ?
YES
NO
Are contaminants from on-site system ?
YES
NO
Try to identify source and recommend protective measures. Record information
Perform soils and groundwater hydrology studies
Header and drainfield excavation
(11)
Are soils and groundwater suitable for existing on-site system ?
YES
NO
Protect well; change location of well or on-site system; investigate community well; off-site wastewater treatment
Determine cause of failure
Obstructions in drainfield
Soil crusting
Poor distribution
Soil hydraulics
Seasonally high water table
Hydraulic overload
Select appropriate technology
Dosing
Pressure distribution
Mounds
Oversized drainfield
Water conservation
Curtain drains
H2O2 treatment
Rod drainfield lines
Alternate drainfield
Holding tanks
Off-site treatment
Plume recapture
Graywater segregation
Reuse/recycle
Replace septic tank or sewers
Record information, schedule future monitoring, design facilities and install
LEGEND
Action to take
Information to choose from
Decision to make
End of sequence

Note: This diagram shows how an individual site with an existing on-site system could be analyzed. Nothing is implied regarding Construction Grants eligibility of specific items or their appropriate timing in the 3-step Construction Grants process.

FIGURE II-A-1. DECISION FLOW DIAGRAM FOR EXISTING ON-SITE SYSTEMS (Numbers in parentheses refer to notes on the following page)

## NOTES

1. If, through previous experience, the cause of the problem can be identified at this point, the detailed site analysis can be bypassed.
2. State standards for minimum setback distances should be used unless a hydrogeologic (or other) reason exists to use a larger distance.
3. In using contaminated wells as a criterion for delineating sewer service areas, only data from protected wells should be used.
4. Odors can come from a properly functioning septic tank/soil absorption system. Relocation of vent may solve the problem.
5. Shoreline scan should be repeated to ensure that plumes are located properly.
6. Well samples should be taken at least twice to ensure reliability of conclusions.
7. If house drains are likely to be clogged, snaking drains may solve problem. Note: monitoring of water meter is required after installation.
8. Septic tank and sewer inspection to include: excavation; pumping; inspection for size, structural integrity, outlet and baffle condition; rodding house and effluent sewers; measuring distance and direction to SAS using snake and metal detector.
9. If septic tank and/or sewers (to and from septic tank) need replacement and additional work on drainfield is required, follow "no" route and investigate other factors before replacing septic tank and/or sewers. This process will avoid replacement of septic tank/sewers when entire system is not functional.
10. Other tests may be substituted if they distinguish between wastewater and non-wastewater sources of well contamination.
11. This procedure is limited to digging and inspecting test pits in the drainfield, excavation and repair of distribution boxes and broken header lines, snaking distribution lines to remove obstructions, and soil borings through drainfield laterals, pits or trenches.

## a. Flow Reduction

EIS V-A-4-a
TRD II-L
TRD IV-D
C.3.

Where the feasibility of retaining on-site systems depends on substantial reductions in wastewater flows, highly effective and perhaps expensive flow reduction devices should be considered. Since toilet use, bathing and clothes washers are the greatest water users in most residences, these should be emphasized in achieving reductions in flow. Waterless toilets (composting, chemical, incinerating or oil-recycle) or very low flow toilets (air assisted or vacuum) can reduce total residential wastewater flows by 30%. Water for showering can be reduced 90% or more by conversion, where feasible, to air assisted showers. The water and energy savings from air-assisted showers would be lost, however, if occupants take tub baths instead; baths generally require more water than even the most wasteful shower. Water for washing clothes can be reduced by replacing top-loading with front-loading washing machines. Use of these devices together can reduce residential wastewater flows by 63% without changes in life style (Baker, 1980).

The expense of this maximum flow reduction approach may be justified when holding tanks are used or when the need for expensive off-site facilities would be avoided. Where need and economics do not justify maximum flow reduction, minimum flow reduction, the use of relatively inexpensive flow reduction devices, can still save the homeowner money and possibly prolong the useful life of his or her on-site system.

Economically, the most attractive devices are low flow shower heads. Heating water is one of the highest utility costs in most residences. The energy savings due to low flow shower heads will pay for new shower heads in a very short time. Other inexpensive devices include toilet tank modifications, faucet aerators, and pressure reducing values. The total flow reduction achievable with minimum flow reduction varies. As an example, a combination of a dual flush device (a toilet tank modification) and a low flow shower head may reduce total water use approximately 10% (Cohen and Wallman, 1974).

## b. Water Metering

EIS V-A-4-a

Water metering can determine whether water use is excessive and suggest a proper course of action for hydraulically overloaded systems. If metering indicates a low to moderate water usage, other sources of hydraulic overloading should be investigated such as foundation or roof drains, air conditioner condensate, or storm water. Where municipalities assume liability for on-site systems or grant restricted use variances, metering may be required to insure operability of systems.

## c. Segregation of Wastes

Depending on the characteristics of wastewater from individual homes, segregating black water (toilet and sometimes garbage disposal waste) from the remaining waste stream can eliminate significant quantities of pollutants, especially nitrates. Waste segregation reduces the hydraulic and organic load to the treatment system, allowing existing treatment systems to operate satisfactorily even if undersized, subject to high groundwater, or subject to some other site limitation. Toilet wastes can be segregated by composting toilets, incineration toilets, or low flow toilets used with holding tanks.

## d. Reuse/Recycle

The reuse of treated wastewater for other household uses is a relatively new idea. The options available vary from using treated gray water for toilet flushing to a proprietary system that recycles the entire wasteflow for potable reuse. Depending on the percentage of wastewater recycled, these systems could be used to overcome any site limitation. The main problems with recycle systems are the lack of long-term operations data, the possible lack of user acceptance, and the relatively high cost of the more effective devices.

### e. Holding Tanks

EIS V-A-4-d

Holding tanks are used to store wastewater (total waste flow or segregated stream) on-site until it is pumped and hauled off-site for treatment and disposal. Because of the massively high cost of pumping, holding tanks are used only 1) when no other option is feasible, 2) in combination with waste stream segregation, or 3) for seasonal residences. Serious application of flow reduction devices is an economic necessity with any waste stream that discharges to a holding tank.

### f. Effluent Plume Recovery

Groundwater plume recovery systems are constructed by locating the groundwater plume downstream from the on-site system and pumping the treated effluent into a lawn irrigation system. The wastewater receives further treatment by the soil and also irrigates the lawn. This technique has not been field tested. Careful attention must be given to odors, public health problems, wet seasons, and freezing of irrigation pipes. A likely situation for use would be for seasonal residences with adequate land available. The chief application of this technique would be for on-site systems on lakeshores where plumes are stimulating aquatic nearshore plant growth.

### g. Limitations

EIS I-B-1

Most of the options discussed for difficult systems cannot solve existing failures alone but must be used in combination with each other or with other technologies for satisfactory results. For example, water conservation and metering may be used in conjunction with flow segregation and a septic tank/shallow placement soil absorption system in order to solve a particular on-site problem satisfactorily. However, economic constraints may prevent combinations of several technologies. Costs for overcoming site limitations may be prohibitive. Another drawback to some of these options is the lack of field data with which to assess their performance and reliability. Systems such as effluent plume recovery, complete recycle, and certain proprietary services for flow reduction and waste segregation should be tried on an experimental basis for typical failing systems in the community and monitored for results. Communities can then choose the option or options that appear best suited to individual problems.

## B. SMALL-SCALE OFF-SITE TREATMENT

### 1. SEPTAGE DISPOSAL

TRD I

Septage from homes is transported either to a treatment system or to an ultimate disposal point as shown in Figure II-B-1. The three major categories of treatment and disposal are (1) direct land application, (2) treatment at a separate septage facility, and (3) addition to a sewage treatment plant. Application of septage to the land is by far the most commonly used means of septage disposal. Of the total septage generated, it is estimated that 60 to 90% is disposed on land. Septage disposal on land can include surface spreading, subsurface injection, spray irrigation, trench and fill, sanitary landfills, and lagooning. Septage pumped from septic tanks is either directly disposed of on land or is treated prior to land disposal.

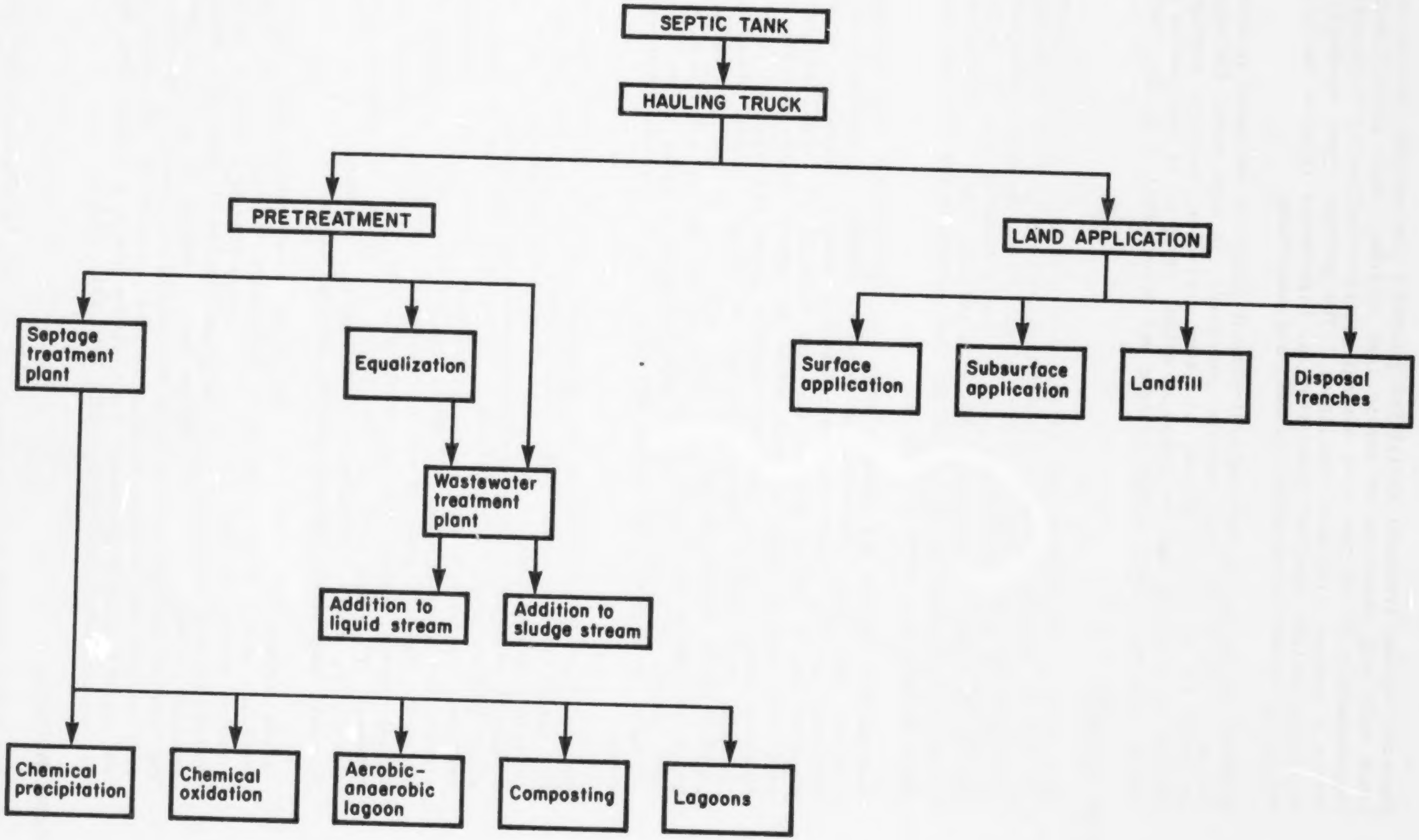

SEPTIC TANK
HAULING TRUCK
PRETREATMENT
LAND APPLICATION
Septage treatment plant
Equalization
Wastewater treatment plant
Addition to liquid stream
Addition to sludge stream
Chemical precipitation
Chemical oxidation
Aerobic-anaerobic lagoon
Composting
Lagoons
Surface application
Subsurface application
Landfill
Disposal trenches

FIGURE II-B-1. SEPTAGE TREATMENT AND DISPOSAL

Separate septage treatment facilities generally are regional facilities in areas with high densities of septic tank systems. Only a small portion (approximately 1%) of the total septage generated nationally is treated in separate septage treatment facilities. The process types currently in operation include chemical precipitation, high-dosage chlorine oxidation, multistage aerobic/facultative lagoons, and composting.

Disposal of septage at wastewater treatment plants is estimated to account for up to 25% of the total septage generated. In most cases, the septage is added to the liquid stream. In some instances, however, septage is handled as a sludge and is processed either alone or in combination with sewage treatment plant sludge (Cooper and Rezek, 1977; U.S. EPA, 1979a).

## 2. COLLECTION SYSTEMS

TRD IV-A When off-site treatment is cost-effective or when site constraints prohibit the use of on-site systems, consideration must be given to collection of wastewater and its transport to a treatment site. The most common methods of collection are conventional gravity, small-diameter gravity, pressure, and vacuum sewers. Topography, depth to bedrock, depth to groundwater and housing density are the major factors that determine the relative costs of these methods in a given setting.

EIS II-F-1 Conventional sewers are usually made of clay but can also be made of plastic, cast iron, concrete, or asbestos cement. A variation of conventional gravity sewers is small-diameter sewers. These 4- or 6-inch diameter sewers can be made of the same material as conventional sewers. Used with septic tanks at each house to remove coarse solids, small-diameter sewers can be laid at slighter grade and require fewer lift stations than larger sewers carrying raw sewage. Other advantages of small-diameter sewers include 1) fewer manholes, 2) use of cleanouts in place of some manholes, 3) lower cost of the smaller sized pipe, and 4) less chance of clogging. Use of small diameter gravity sewers to convey effluent is a recognized technology under several regional model sanitary codes.

Two types of pressure sewers are available: grinder pump pressure sewers and septic tank effluent pump (STEP) sewers. The grinder pump does not require a septic tank at each house as the STEP system does. Both systems transport wastewater under pressure to a treatment facility or to an area where gravity sewers are utilized. Infiltration and inflow common in conventional sewers are nonexistant in pressure sewers. Other advantages of pressurized sewer systems include 1) smaller sized pipes, 2) easier installation (a downhill grade is not necessary), 3) and lower costs than conventional sewers, especially in areas of steep slopes or shallow bedrock. However, the lower cost of the sewers is offset by pumping units and electricity costs. Density of development, therefore, is a factor in economic comparisons between gravity and pressure sewers.

Vacuum sewers have the same advantages over conventional sewers that pressure sewers have. The main difference between vacuum sewers and pressure sewers is that wastewater is transported by a central vacuum pump instead of many individual pressure pumps located at individual residences. Neither pressure sewers nor vacuum sewers depend on gravity; therefore, detrimental impacts of disturbing streambeds and low-lying wetlands during construction can be more readily avoided. Generally, the costs (capital and operation and maintenance) for pressure sewers are lower than the costs for vacuum sewers (U.S. EPA, 1980b; U.S. EPA, 1977a).

## 3. TREATMENT METHODS

TRD I Wastewater treatment technologies for off-site treatment can be grouped in three categories according to method of effluent discharge: 1) land application (surface and subsurface), 2) wetland discharge, and 3) surface water discharge.

TRD II-K Off-site subsurface disposal systems for several buildings are known as cluster systems. Pretreatment by septic tanks is required for cluster systems. The septic tanks can be located at individual houses (prior to collection) or off-site, after collection and transportation. Cluster systems resemble individual subsurface disposal systems in design and construction but are sized for the flow from more than one household. To ensure proper distribution, cluster systems usually employ some form of dosing. Alternating drainfields are often used to allow drainfield resting and provide emergency backup.

The predominant surface land application processes are shown in Table II-B-1 along with characteristics of each process.

When considering the type of land application process to use, design factors such as those following should be considered (U.S. EPA, 1977b; U.S. EPA, 1976a):

- wastewater characteristics,
- climatic conditions (water balance),
- soil characteristics,
- land area required,
- existing and surrounding land use,
- preapplication treatment,
- surface and groundwater hydrology,
- vegetative cover,
- treatment efficiency, and
- ultimate disposal.

TABLE II-B-1. LAND TREATMENT OPTIONS AND CHARACTERISTICS

Irrigation

- Predominant land application method
- Indirect or no surface water discharge
- Uses wastewater for production of marketable crops
- Groundwater recharge
- Typical land requirement of 100 to 200 wet acres/mgd
- Moderately slow to moderately rapid soil permeability

Infiltration-Percolation

- Indirect or no surface water discharge
- After infiltration, renovated effluent can be recovered (underdrains or pumped withdrawal) or allowed to recharge groundwater
- High-rate systems require 3 to 6 wet acres/mgd
- Low-rate systems require 20 to 60 wet acres/mgd
- Rapid soil permeability (sands, loamy sands)

Overland Flow

- Ultimate disposal of runoff is required
- Land requirements typically range from 25 to 110 wet acres/mgd
- Generally does not provide the BOD and SS removals that irrigation and infiltration-percolation do
- Slow soil permeability (clays, silts, and soils with impermeable barriers)

Wastewater treatment can be accomplished by natural or artificial wetlands. Table II-B-2 lists the typical systems that have been investigated for artificial and natural wetlands. Prior to selecting natural wetland application as a treatment alternative, an inventory of available wetland sites should be made. Site characteristics (hydrogeological, biological, etc.) must be investigated in detail if preliminary planning stages indicate that wetlands discharge is a competitive option. Reliable design criteria have not been developed that can be applied as "rules of thumb" for sizing and estimating performance of wetland treatment systems. Pilot scale testing should be conducted to determine the site-specific criteria (Tchobanoglous and Culp, 1979). U.S. EPA Region V is preparing a Generic EIS on wetlands discharges.

Surface water discharges are often not considered for lake areas when such discharges are likely to add to the nutrient level of the lake. In some instances, however, surface water discharges are necessary, such as when soils are unsuitable either for on-site systems or for land application. In these cases, the selection of treatment facilities for small communities should be governed by the simplicity of the treatment process and low operation and maintenance requirements, in addition to such usual constraints as required effluent quality. Examples of simple treatment systems for surface discharge are listed in Table II-B-3.

## C. NEEDS DOCUMENTATION POLICIES

Discovery, understanding, and appropriate response to actual problems are the essence of good sanitary engineering practice. They are equally valuable to projects being designed or built with or without State or Federal assistance.

CWA 201 (1)(1) Many elements of the following discussion specifically relate to the Construction Grants Program and to policies and guidance in effect before May, 1982. Although no longer required, they offer an outline of prudent practice likely to result in a savings of time and effort. The elimination of Step 1 funding means that new applicants for Federal funding are as free to simplify and improvise as those planning no application.

### 1. NATIONAL

EIS I-B-3 In the first years of the current Construction Grants program under P.L. 92-500, detailed analysis of need for facility construction was seldom provided in Step 1 facilities plans. There were enough obviously severe water quality problems to fill up state priority lists. The priority lists reflected needs recognized by the states. Primary treatment, no treatment, and raw sewage overflows did not require analysis; they required action. Undoubtedly, many auxiliary facilities, such as interceptor and collector sewers for which the need was not so obvious, also were funded. The largest and most severe problems have now been addressed by the Construction Grants program. Some have been resolved, and others are well on their way to resolution.

Projects being considered for initial Step 1 funding in the middle 1970s, however, did not display such obvious needs or were smaller than earlier projects. Proposed auxiliary facilities began to represent much greater proportions of the total project. In some projects, the costs of new sewers represented more than 80% of total project costs. The need for these expenditures was typically documented by about the same level of analysis as for earlier projects.

U.S. EPA Headquarters responded to this situation by distributing Program Requirements Memorandum, PRM 77-8, later superceded by PRM 78-9, which established criteria for eligibility of collector sewers, the publicly owned laterals that typically are the point of connection for privately

TABLE II-B-2. TYPES (AND LOCATION) OF PREVIOUSLY INVESTIGATED WETLAND SYSTEMS

Natural Wetlands

- Peatlands (Michigan, Wisconsin)
- Cattail marshes (Wisconsin)
- Freshwater tidal marsh (New Jersey)
- Lacustrine Marsh (Hamilton, Ontario, Canada)
- Swamplands (Hay River, Canada)
- Wetlands, general (Massachusetts, Florida)
- Cypress domes (Florida)

Artifical Wetlands

- Meadow-marsh-pond system (New York)
- Ponds with reeds or rushes (Germany, Holland)
- Peat filled trench systems (Finland)
- Peat filter (Minnesota)
- Marsh pond system (California)

TABLE II-B-3. SURFACE WATER DISCHARGE OPTIONS FOR SMALL COMMUNITIES

Lagoons

- Facultative
- Aerobic
- Anaerobic
- With or without sand filters

Fixed Film Reactors

- Rotating biological contactors
- Trickling filters (various media, various rates)

Activated Sludge

- Oxidation ditch
- Package type (complete mix, contact stabilization, extended aeration)

owned house sewers. These criteria and their sequence of application in eligibility decisions are presented in Figure II-C-1 as interpreted from PRM 78-9 and modified by recent guidance, Construction Grants - 1982. The crux of this decision flow diagram is that a need must be documented for a gravity collector sewer to be eligible. Then, if the need is demonstrated, it must be shown that the sewer is the cost-effective means to satisfy the need.

EIS I-B-3

U.S. EPA Headquarters subsequently issued PRM 79-8, which provides guidance for considering small wastewater systems. The important part of this guidance relevant to needs documentation was discussed in Section I.B.3 of this EIS. Briefly stated, the policy is that field work required to document the actual type and frequency of problems with on-site systems is eligible, but that the field work in Step 1 facilities planning should be limited to what is reasonably required to prepare a cost-effectiveness analysis.

CWA 201(1)(1)
CWA 201(1)(2)
CWA 216

The 1981 Amendments to the Clean Water Act eliminated grants for planning and design. An allowance procedure was authorized to replace grants as a means for defraying the cost of these activities. The changes in the Act and its implementing regulations have alleviated these previous concerns about eligibility of specific needs documentation tasks. However, the fundamental principles of demonstrating need for proposed facilities and selecting cost-effective solutions to remedy identified public health and water quality problems have been reaffirmed. U.S. EPA's concern now is to assist applicants in meeting these goals as expeditiously as possible.

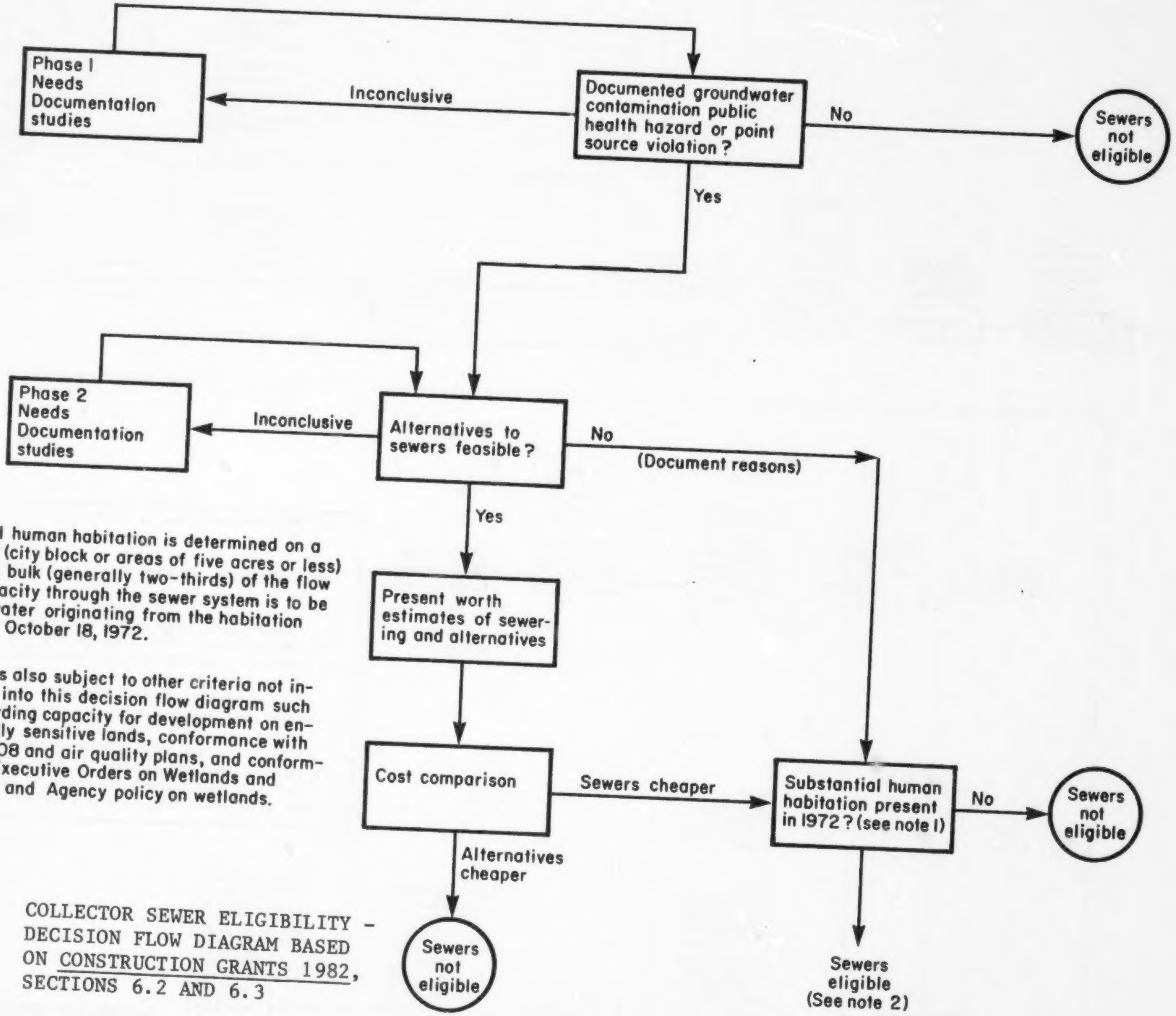
## 2. REGION V

Region V's guidance on needs documentation is based on national policy, experience gained during preparation of the Seven Rural Lake EIS's, and input from states in the region. A copy of Region V's guidance is attached as Appendix A. A key feature of this guidance is sequencing of needs documentation activities with alternative development, costing, selection, and design. Also, decision points are identified at which the results of needs documentation work can be reviewed. The scope of facilities planning can then be adjusted appropriately.

CWA 201(1)(1)

Region V's guidance was in effect prior to passage of the 1981 Amendments to the Clean Water Act and prior to preparation of the May 12, 1982, interimfinal regulations implementing the Act. Nevertheless, the guidance reflects good practice and has not been altered in substance by changes to the Act and regulations except that references to grant eligibility of specific tasks and their acceptable timing in Step 1 and Step 2 are no longer appropriate.

The accompanying process diagram (Figure II-C-2) shows how needs documentation and alternative development tasks can be sequenced for a complex planning situation. Sequencing of these tasks can prevent wasted time and money spent on field work where centralized solutions might prove to be cost-effective. Sequencing also provides check points where the scope of upcoming tasks can be modified to reflect recently acquired data. Additional discussion of sequencing and more examples of how it can be applied are available in Technical Reference Document XVI.D., "Alternative Construction Grants Procedures for Small Waste Flow Areas" reproduced in Appendix A of this Final EIS. Chapters III-V discuss the other two important aspects of such an optimum operation alternative: community management and the mechanics of the grant program itself. Taken together, these chapters constitute a road map for planning the management and design of optimum operation alternatives.

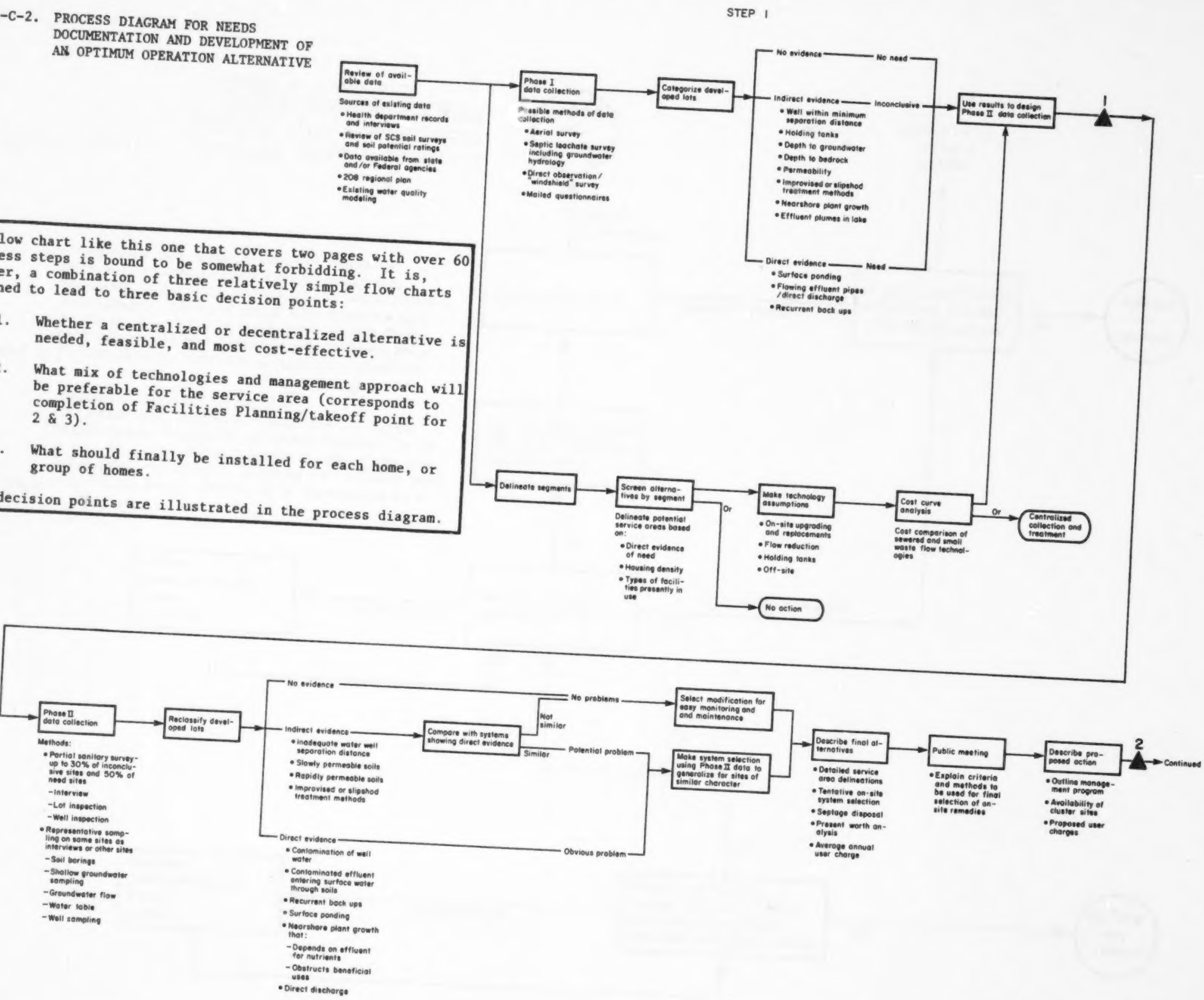

Phase I
Needs
Documentation
studies
Inconclusive
Documented groundwater contamination public health hazard or point source violation ?
No
Sewers not eligible
Yes
Phase 2
Needs
Documentation
studies
Inconclusive
Alternatives to sewers feasible ?
No
(Document reasons)
Yes
Present worth estimates of sewering and alternatives
Cost comparison
Sewers cheaper
Substantial human habitation present in 1972 ? (see note 1)
No
Sewers not eligible
Alternatives cheaper
Sewers not eligible
Sewers eligible (See note 2)

Note 1: Substantial human habitation is determined on a small tract (city block or areas of five acres or less) basis. The bulk (generally two-thirds) of the flow design capacity through the sewer system is to be for wastewater originating from the habitation existing on October 18, 1972.

Note 2: Eligibility is also subject to other criteria not incorporated into this decision flow diagram such as not affording capacity for development on environmentally sensitive lands, conformance with approved 208 and air quality plans, and conformance with Executive Orders on Wetlands and Floodplains and Agency policy on wetlands.

FIGURE II-C-1. COLLECTOR SEWER ELIGIBILITY - DECISION FLOW DIAGRAM BASED ON CONSTRUCTION GRANTS 1982, SECTIONS 6.2 AND 6.3

FIGURE II-C-2. PROCESS DIAGRAM FOR NEEDS DOCUMENTATION AND DEVELOPMENT OF AN OPTIMUM OPERATION ALTERNATIVE

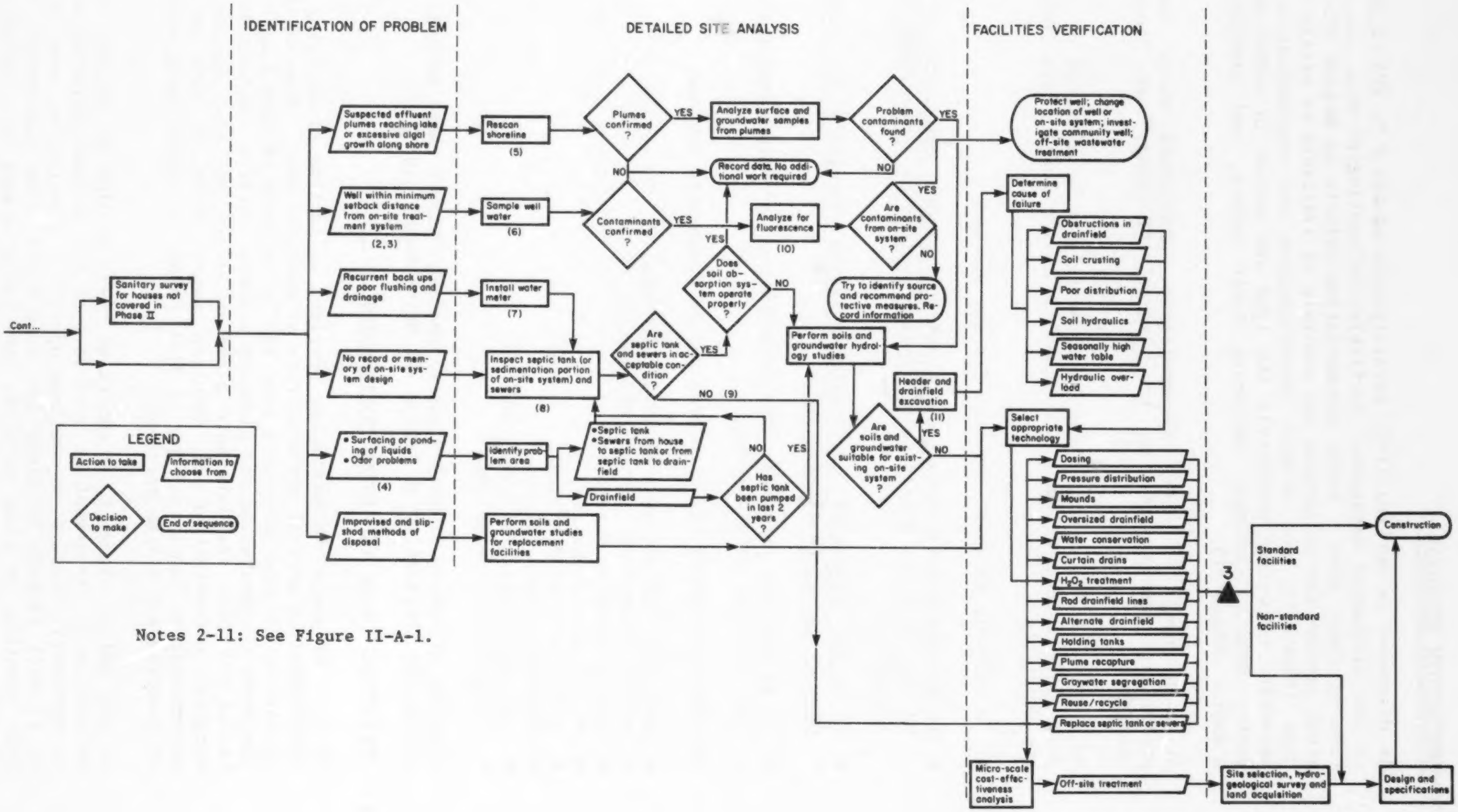

STEP 1
Review of available data
Sources of existing data
• Health department records and interviews
• Review of SCS soil surveys and soil potential ratings
• Data available from state and/or Federal agencies
• 208 regional plan
• Existing water quality modeling
Phase I data collection
Possible methods of data collection
• Aerial survey
• Septic leachate survey including groundwater hydrology
• Direct observation/ "windshield" survey
• Mailed questionnaires
Categorize developed lots
No evidence
No need
Indirect evidence
• Well within minimum separation distance
• Holding tanks
• Depth to groundwater
• Depth to bedrock
• Permeability
• Improvised or slipshod treatment methods
• Nearshore plant growth
• Effluent plumes in lake
Inconclusive
Direct evidence
• Surface ponding
• Flowing effluent pipes /direct discharge
• Recurrent back ups
Need
Use results to design Phase II data collection
1
Delineate segments
Screen alternatives by segment
Delineate potential service areas based on:
• Direct evidence of need
• Housing density
• Types of facilities presently in use
Or
No action
Make technology assumptions
• On-site upgrading and replacements
• Flow reduction
• Holding tanks
• Off-site
Cost curve analysis
Cost comparison of sewered and small waste flow technologies
Or
Centralized collection and treatment
Phase II data collection
Methods:
• Partial sanitary survey-up to 30% of inconclusive sites and 50% of need sites
-Interview
-Lot inspection
-Well inspection
• Representative sampling on same sites as interviews or other sites
-Soil borings
-Shallow groundwater sampling
-Groundwater flow
-Water table
-Well sampling
Reclassify developed lots
No evidence
Indirect evidence
• Inadequate water well separation distance
• Slowly permeable soils
• Rapidly permeable soils
• Improvised or slipshod treatment methods
Direct evidence
• Contamination of well water
• Contaminated effluent entering surface water through soils
• Recurrent back ups
• Surface ponding
• Nearshore plant growth that:
-Depends on effluent for nutrients
-Obstructs beneficial uses
• Direct discharge
Compare with systems showing direct evidence
Not similar
Similar
No problems
Potential problem
Obvious problem
Select modification for easy monitoring and and maintenance
Make system selection using Phase II data to generalize for sites of similar character
Describe final alternatives
• Detailed service area delineations
• Tentative on-site system selection
• Septage disposal
• Present worth analysis
• Average annual user charge
Public meeting
• Explain criteria and methods to be used for final selection of on-site remedies
Describe proposed action
• Outline management program
• Availability of cluster sites
• Proposed user charges
2
Continued

Any flow chart like this one that covers two pages with over 60 progress steps is bound to be somewhat forbidding. It is, however, a combination of three relatively simple flow charts designed to lead to three basic decision points:

1. Whether a centralized or decentralized alternative is needed, feasible, and most cost-effective.
2. What mix of technologies and management approach will be preferable for the service area (corresponds to completion of Facilities Planning/takeoff point for 2 & 3).
3. What should finally be installed for each home, or group of homes.

These decision points are illustrated in the process diagram.

FIGURE II-C-2. cont...


IDENTIFICATION OF PROBLEM
DETAILED SITE ANALYSIS
FACILITIES VERIFICATION
Cont...
Sanitary survey for houses not covered in Phase II
Suspected effluent plumes reaching lake or excessive algal growth along shore
Well within minimum setback distance from on-site treatment system
(2,3)
Recurrent back ups or poor flushing and drainage
No record or memory of on-site system design
• Surfacing or ponding of liquids
• Odor problems
(4)
Improvised and slipshod methods of disposal
Rescan shoreline
(5)
Sample well water
(6)
Install water meter
(7)
Inspect septic tank (or sedimentation portion of on-site system) and sewers
(8)
Identify problem area
Perform soils and groundwater studies for replacement facilities
Plumes confirmed ?
YES
NO
Contaminants confirmed ?
YES
Are septic tank and sewers in acceptable condition ?
YES
NO (9)
Does soil absorption system operate properly ?
YES
NO
•Septic tank
•Sewers from house to septic tank or from septic tank to drainfield
Drainfield
Has septic tank been pumped in last 2 years ?
NO
YES
Analyze surface and groundwater samples from plumes
Record data. No additional work required
Analyze for fluorescence
(10)
Problem contaminants found ?
YES
NO
Are contaminants from on-site system ?
YES
NO
Try to identify source and recommend protective measures. Record information
Perform soils and groundwater hydrology studies
Are soils and groundwater suitable for existing on-site system ?
YES
NO
Header and drainfield excavation
(11)
Protect well; change location of well or on-site system; investigate community well; off-site wastewater treatment
Determine cause of failure
Obstructions in drainfield
Soil crusting
Poor distribution
Soil hydraulics
Seasonally high water table
Hydraulic overload
Select appropriate technology
Dosing
Pressure distribution
Mounds
Oversized drainfield
Water conservation
Curtain drains
H₂O₂ treatment
Rod drainfield lines
Alternate drainfield
Holding tanks
Plume recapture
Graywater segregation
Reuse/recycle
Replace septic tank or sewers
Micro-scale cost-effectiveness analysis
Off-site treatment
3
Standard facilities
Non-standard facilities
Construction
Site selection, hydrogeological survey and land acquisition
Design and specifications
LEGEND
Action to take
Information to choose from
Decision to make
End of sequence

Notes 2-11: See Figure II-A-1.

## D. NEEDS DOCUMENTATION METHODS

As discussed in Section II-C, participation of the U.S. EPA in the funding of new wastewater management facilities is contingent upon the documentation of their need. Needs documentation efforts in Region V's unsewered areas involve the collection and analysis of available or easily obtainable data (Phase I), and on-site investigations and representative sampling necessary to define adequately the type and extent of water quality and public health problems, determine their causes, and predict remedial measures (Phase II).

At each stage of needs documentation, individual sites can receive preliminary assignments to the "need," "no-need," or "inconclusive" categories.

As Figure II-C-2 shows, these assignments may be reviewed or revised as data collection proceeds. The purposes of the Phase I and Phase II work are four-fold:

- To reliably estimate the need for any action,
- To delineate areas requiring no action, optimum operation of existing on-site systems, small-scale off-site systems or centralized sewers and treatment,
- To support estimates of on-site measures necessary to construct an optimum operation alternative,
- To effectively organize data acquisition, avoiding duplication of on-site work and excavations.

Recommended methods by which need may be documented include:

- gathering and analysis of available data,
- aerial photographic interpretation,
- septic leachate detection,
- mailed questionnaires,
- eutrophication modeling
- nearshore plant surveys
- partial sanitary surveys, and
- representative samplings.

With the exception of mailed questionnaires, all of these methods were used during the preparation of Region V's Seven Rural Lake EIS's.

### 1. PHASE I: EXISTING DATA AND DATA COLLECTION

Phase I of needs documentation involves collection of existing data, and development of general areawide data at moderate cost. Some of the methods of data collection described here may be valuable in more than one part of the needs documentation and planning process. Septic leachate detection is useful not only for lakeshore plume detection but also for detection of marginal contamination of drinking water wells as part of Phase II representative sampling. Aerial photography is useful for a whole variety of planning and design purposes.

At the end of Phase I it should be clear whether no action, centralized collection and treatment or some form of the optimum operation alternative is necessary. Within the optimum operation alternative, need or the lack of it will already be clear for many sites. The information that makes this possible is also vital to the early stages of alternative design (alternative screening, technology assumptions, and cost curve analysis as described in Section II-E).

### a. Gathering and Analysis of Available Data

The use of available data can provide a rapid and inexpensive means of defining the need for improved wastewater management facilities on an areawide basis. Relevant data assessment efforts include:

- Review of local well and septic tank permit records maintained by public health agencies. Repair permits for septic tank systems can provide valuable data on the types, frequencies, and causes of system failures, as well as historical solutions to on-site system problems. Review of records containing information on the bacteriological quality of private water supply systems can provide information on the location of wells that may have been contaminated by on-site sewage treatment systems.

- Interviews with sanitarians, soil scientists, septic tank installers and haulers, well drillers, and zoning officers. Information gathered during these interviews can identify the location of on-site system problems (surface malfunctions, sewage backups,illicit discharges, etc.) and pinpoint areas in need of further investigation during Phase II. System problems attributed to poor site conditions or inadequate maintenance practices can be identified through discussion with these officials and contractors.

- Windshield surveys. An automobile tour of the entire community in the company of local sanitarians, soil scientists, or other knowledgeable persons (see interviews above) can provide first-hand observation and interpretation of site conditions and on-lot system practices. This information will help the applicant's small waste flows specialist develop a strategy and cost estimate for Phase II field investigations.

TRD III-A
EIS II-A-3-c

- Review of soil maps. General and detailed soil maps may be available to the small waste flows specialist for use as a guide to planning needs documentation efforts. They do not by themselves document need. Soil surveys are published by the U.S. Department of Agriculture Soil Conservation Service in cooperation with state agricultural experiment stations. General soil maps, with map units consisting usually of soil associations drawn at a scale of 1 inch to the mile or less, can be used for preliminary determinations of the potential suitability of on-site systems on a community-wide basis. Detailed soil maps, which delineate soil series, soil complexes, and undifferentiated units at a scale of approximately 4 inches to the mile, and soil interpretation data enable the applicant to estimate what percentage of lots can be expected to be served satisfactorily by on-site systems. It is emphasized that neither detailed soil maps nor soil limitation ratings contained in the soil surveys provide a documentation of need. However, they are particularly useful in planning site-specific field investigations of on-site system suitability.

TRD XI-B

EIS IV-D-1

- Preparation of base maps. A recommended final step in the gathering and analysis of available data involves the preparation of a base map. This synthesizes information collected and facilitates its use in subsequent needs documentation efforts. Synthesized data could include soil and groundwater conditions, land use, and age and density of housing. U.S. Geological Survey 7.5 minute maps (1:24,000), Soil Conservation Service soil maps (1:15,840), or local tax maps can be used to prepare planning area base maps at low cost. Maps that illustrate the location of individual buildings are particularly useful. Overlays can be prepared that delineate:

  - developed areas obviously requiring centralized facilities.
  - individual buildings with obvious problems, and
  - developed areas with indirect evidence of problems.

- Review of Available Water Quality and Eutrophication Modeling. Existing data may include water quality or eutrophication modeling from any of a variety of sources such as the National Eutrophication Survey and various state and 208 surveys. These may be valuable in making preliminary estimates about the relative role of on-site systems and non-point pollution sources, so that efforts may be concentrated in those areas yielding the greatest water quality improvement. It is very important, however, to know the assumptions made in development of the model and how they may be modified by actual on-site system performance.

### b. Aerial Photographic Interpretation

TRD II-F

Properly acquired and interpreted aerial photography can provide data on surface malfunctions of on-site systems. With this technique, a community survey can be made rapidly and at relatively low cost without intruding on private property. Aerial photography detection of surface malfunctions is a 3-step process involving acquisition of the photography, identification of suspected malfunctions by an experienced photo interpreter, and field checking of the suspected malfunctions.

Optimum coverage, resolution, and signature recognition can be achieved using fine grained color infrared film flown to a scale of approximately 1:8000 (1 inch = 1667 feet). Other image types can be acquired in conjunction with the color infrared film, such as true color, thermal infrared, or thermal scans. However, experienced photo interpreters (Evans, 1981) feel that color infrared film will be adequate. Both true color and color infrared film were acquired and used comparatively for identifying surface malfunctions during preparation of the Seven Rural Lake EISs.

Timing of the flight is an important consideration in remote sensing of surface malfunctions. These failures can best be detected when groundwater elevations are highest and foliage is minimal. Therefore, best results for permanent residences are obtained during spring or late winter when the ground is not snow covered. Tree cover present during the remainder of the year can limit detection of surface malfunctions. In cases where aerial photographs must be taken during summer months, such as in communities with seasonal populations, the subsequent interpretation and field checking phases must be conducted more cautiously. Also, flights can be completed with substantial overlap of photos affording stereoscopic analysis of on-lot features. Interpreters can actually see under some taller trees.

Suspected malfunctions should be identified from the photography by an experienced photo interpreter. The experience is needed to distinguish valid signatures from those of unrelated phenomena such as shade, natural vegetation and wet soils, and artificial surface drainage features. Surface manifestations of surface malfunctions include:

- conspicuously lush vegetation,
- dead vegetation (especially grass),
- standing wastewater or seepage, and
- dark soil indicating excessive accumulation of organic matter.

EIS IV-G

The suspected malfunctions should be field checked. The ideal person to do this is the photo interpreter although others may perform this task. By inspection and, if feasible, by interview with the residents, the suspected malfunctions are reclassified as:

- confirmed malfunctions - standing wastewater from an on-site system is visible on the land surface,

- marginal malfunctions - accumulation of excess organic matter or the presence of dead vegetation indicate that wastewater had surfaced in the past, or

- irrelevant signatures - visible surface or vegetative features which mimic the visual characteristics of malfunctions but are not caused by wastewater.

TRD X-B
XI-B

Aerial photography acquired for this purpose can be used for other purposes during facilities planning such as:

- house counts,
- land use, vegetation and wetlands analysis, and
- layout of wastewater collection and transmission facilities.

To accomplish the last purpose, precision flights are necessary to overcome resolution problems that can result from the normal tilting of the airplane during photo missions. No special preflight measures (establishment of reference points, etc.) are required. Available maps can serve as a guide on precision flight missions. Precise photo missions enhance the three-dimensional effect already characteristic of aerial photographs, thereby enabling facilities planners to complete detailed design of wastewater collection and transmission facilities. These data supplement those contained on USGS topographic maps. The cost of precision flights can be expected to be approximately 50% greater than normal photographic missions. The decision to make a precision flight should be based on the likelihood of large portions of the facilities planning area requiring centralized collection and treatment. Otherwise the extra cost cannot be justified.

### c. Septic Leachate Detection

TRD II-D&E

Currently available septic leachate detectors can be used to locate groundwater inflows or surface runoff conveying domestic wastewater into lakes. The operational theory of the detector depends on the assumptions that fluorescent organic materials are present in wastewater and that inorganic chemicals will be present in wastewater at higher concentrations than in ambient groundwater or surface water. Detection of both increasing fluorescence and increasing conductivity in water drawn by pump from a shoreline provides tentative evidence of the presence of domestic wastewater. Because of the high sensity of their fluorometers, currently available detectors can rapidly locate groundwater effluent plumes and wastewater in surface runoff where wastewater is otherwise undetectable. This tool proved to be invaluable in studies that addressed the impacts of on-site systems on lakes studied for the Seven Rural Lake EIS's.

The septic leachate detector is subject to certain limitations that must be recognized in its use and in interpretation of the data it generates. The most significant limitation is that it cannot quantify the strength of wastewater in a sample or body of water. The organic and inorganic parameters that it monitors can be transported through soil and water quite independently of other wastewater constituents. Even the fluorescence and conductivity are recorded in relative, not quantitative, units. In order to quantify the concentrations of nutrients, bacterial, or other wastewater constituents, flow through the meter can be subsampled or samples can be collected by conventional means for later analysis. The advantage of the detector is that it permits collection of samples in suspected effluent plumes so that random sampling is avoided.

EIS IV-E-1

Aside from the limit on quantification, septic leachate detector surveys are subject to false positives and false negatives. Most of these potential errors are due to the dynamic nature of the natural systems involved and to variability in wastewater characteristics. False positives can be caused by:

- Naturally fluorescent decay products from dead vegetation. Swamps, marshes and peat deposits can leach tannins, lignins and other organic compounds that fluoresce in the detection range of the fluorometer. The conductivity measurements provided by the detector are intended to differentiate such signals, but in practice dilution may eliminate detectable conductivity changes expected from wastewaters, thus making a wastewater plume appear to be the same as natural decay products.

- Sediment or air drawn through the detector can cause dramatic changes in the monitor readings. This is usually noted by the operator and recorded on the recorder tape.

- Eddy currents carrying large wastewater or bog plumes can appear to be individual plumes from on-site systems.

The more serious errors are false negatives since they may indicate no problem where actual problems might exist. Notable false negatives are:

- As mentioned above, high dilution of wastewater in lake or groundwater may reduce conductivity differences to the level of normal background variations.

  The absence of conductivity differences will cause the detector to electronicly mask fluorescence signals that are detected.

- Mixing of lake water by wind and waves can disperse leachate very rapidly so that normally strong effluent plumes can be missed altogether. The time it takes for leachate to accumulate along a shoreline to detectable concentrations is dependent on several, so far unstudied, factors.

- Fluctuations in lake level can slow or even reverse normal groundwater flow, temporarily eliminating leachate emergence at a shoreline.

- Groundwater recharge by rainfall, snowmelt or irrigation will also affect the dynamics of leachate movement.

- Seasonal use of dwellings may result in only periodic emergence of leachate at a shoreline.

Due to these factors, the data generated by septic leachate detectors has to be carefully interpreted before it can be considered to be useful information. Interpretation is aided by supplementary data collected or recorded before, during, and after the shoreline scan as noted:

Before

- watershed boundaries
- groundwater aquifer characteristics
- groundwater flow as determined by meters or other methods
- soil types
- wetlands and other sources of organic decay products in the watershed
- locations of surface malfunctions identified by aerial photography interpretation
- information on design, usage, and performance of onsite systems if available
- changes in lake elevation.

During

- weather conditions - especially wind, speed and direction, and recent rainfall
- lake stratification and surface currents
- observed non-wastewater sources of fluorescence or conductivity such as culverts, drainage ditches, salt storage areas, landfills, abundant organic material in near-shore sediments

- observed direct discharges
- likely proximity of on-site systems near shoreline
- operational mishaps such as stirred up sediments, air drawn through meter and engine backwash
- sensitivity and zero adjustments for fluorescence and conductivity channels
- frequent notation of visual meter readings
- location, time, and conditions of water sample collection.

After

- water sample analysis results.

Because of the possibilities for error and the many factors influencing the result of septic leachate detection, the validity of surveys rests heavily on the experience, knowledge, and judgment of the surveyor. Until additional evaluation is made of the factors influencing survey results, septic leachate surveys will be eligible for Construction Grants funding only when:

1) the person in charge is experienced in operation and maintenance of the detector model being used. At least two weeks of field experience is necessary assisting someone who is already expert with the model,

2) the person in charge is present during any shoreline scans that are reported,

3) data is interpreted by a person who has a professional background in limnology, and

4) approximate wind speed and direction are noted during the survey and reported.

Septic leachate detectors should prove to be valuable monitoring tools for communities managing shoreline on-site systems. Purchase of detectors will be eligible for Construction Grants funding. Grantees will be required to show that comparable instruments are not available on a timely basis from other nearby grantees. Funded instruments will be made available to other grantees.

### d. Mailed Questionnaires

Mailed questionnaires enable the applicant to exchange information with the community that will be affected by the results of the needs documentation effort. The objectives of this method are to:

- Inform affected residents of the
    - objectives and scope of facilities planning effort,
    - importance of needs documentation to facilities planning,
    - needs documentation results to date,
    - importance of public response to the questionnaire and how questionnaire data will affect planning efforts, and
    - other opportunities available for public participation;
- Obtain information on
    - the nature and extent of existing pollution and public health problems as recognized by local residents,
    - private wastewater management systems including type, age, location on property, maintenance records, proximity to private water supply and surface water bodies,
    - lot size,

- dwelling use (number of bedrooms, permanent or seasonal status),
- private wells including type, construction, location, depth, etc., and
- water use in the home;

- Determine willingness of residents to allow follow-up surveys and site investigations.

The questionnaire should be as general as possible and should be prepared with an awareness that responses are going to be only as good as 1) residents' knowledge of their own property, 2) their understanding of the questions being asked, and 3) their willingness to exchange information. Because their response to the questionnaire could lead to replacement or renovation of their systems at significant cost, residents may feel it is in their best interests not to divulge information about their sewage disposal systems. A concise explanation of the questionnaire's purpose may improve public cooperation and participation in this impersonal yet comprehensive survey of community need.

### e. Eutrophication Modeling

EIS IV-E-2

For developed lakeshores, needs documentation may include modeling of the impact of on-site systems on lake eutrophication potential. A preliminary estimate can be made with a procedure described in Chapter IV-E-2. The procedure uses basic hydrological and morphological data for lakes. Based on the outcome of this estimate, development of more detailed nutrient budgets may be justified, possibly supplemented by collection of water quality data to resolve major uncertainties.

### f. Nearshore Plant Surveys

Septic tank effluents transported to lakes by groundwater can stimulate growth of attached and floating plants along lakeshores. Where natural factors do not control this growth and it prevents recreational use of the water, abandonment of on-site systems might be justified. Surveys that determine the location and density of nearshore plant growth are a legitimate needs documentation method. Aerial photography taken during the growing season can guide such surveys. Nearshore plant surveys are best conducted along with septic leachate detector or partial sanitary surveys (see Chapter II-D-2-a) since total cost would be minimized. Results can be correlated with known locations of effluent plumes and other treatment problems.

## 2. PHASE II: DATA COLLECTION AND COMPARISON

If Phase I does not adequately quantify or identify the causes of on-site system failures, then a second phase of needs documentation and alternative development may be necessary. The Phase II data collection and subsequent analysis allows needs documentation to proceed further greatly reducing the number of "inconclusive" lots. It does this by surveys of selected sites (both by interview and representative soil and groundwater sampling). Its aim is not necessarily to do these things for all inconclusive sites but to study enough of them that reasonable conclusions about systems not studied may be drawn from those that have been.

Phase II data collection, like that of Phase I, affects not only needs documentation but actual alternative design. It makes possible a preliminary system selection for each dwelling in the study area. As with needs documentation, not every site receives an interview, survey and sampling, but only those providing sufficient conclusions about the sites not studied. This is discussed at length in Section II-E.

### a. Sanitary Surveys

TRD II-G Phase I needs documentation efforts will have involved the gathering and analysis of available or easily obtainable data regarding the type, extent, and frequency of on-site system malfunctions. Phase I data will have been used to categorize developed lots within the facilities planning area into one of three groups: those with obvious problems, no problems, or inconclusive problems. Field work in Phase I will have been limited to rapid, community-wide surveys requiring little or no access to private property. If available data does not document the causes of system failures, only hypothetical statements can be made about continued performance of existing on-site systems.

Sanitary surveys and concurrent representative samplings are field investigative efforts (Phase II) that develop the empirical data necessary for performance explanation or prediction relevant to existing and future systems, respectively. The primary objectives of such efforts are to:

- reclassify surveyed lots from the "inconclusive" category to "obvious problem," "no problem," or "potential problem,"[3] and
- develop requisite information to predict appropriate technologies and attendant costs for responding to community wastewater management problems.

Survey design may be either random or targeted. The intent of a random survey is to obtain as accurate an estimate of failure rate as possible with a limited number of on-site sanitary inspections. Random surveys are appropriate where Phase I needs data are incomplete or where most developed lots remain in the "inconclusive" category. Any bias in the selection of properties to be inspected must be noted. Such bias must be accounted for when projecting survey results to uninspected systems in the same segment or community. As a rule of thumb, random surveys may include 20% of properties in each segment. (Guidance that is statistically more valid should be developed by U.S. EPA or the states after a number of small waste flow projects are completed and the correlation between number of systems inspected and accuracy of the survey statistics is analyzed.)

Targeted surveys are indicated where the types and frequencies of failures are adequately estimated from Phase I information but where evidence of causal connections between poor performance and site, design, and usage characteristics is sought. With this survey design, properties are selected for inspection if they have "obvious problems" or if they are suspected of having problems based on age or known site limitations.

Within a community, sanitary surveys may be designed segment-by-segment to be random or targeted as appropriate. It is emphasized that statistics on failures and potential remedies obtained during random surveys are not interchangeable with statistics from targeted survey areas and vice versa. Causal relationships between system performance and characteristics of the site, system design or system usage established by surveys may be meaningful community-wide, however.

EIS II-A-4 Formats for on-site sanitary inspections should be sufficiently general to be used on either a random or targeted basis. At a minimum, inspections should involve for each building:

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[3] Potential problems are systems that do not yet exhibit direct evidence of failure but that can reasonably be expected to fail in the future as predicted by the failures of similar systems.

- an interview with the resident to determine age of the building and sewage disposal system, design and location of the sewage disposal system, system maintenance, occupancy of the building, water-using appliances, use of water conservation devices, and problems with the wastewater system;

- an inspection of the property, preferably in the company of the resident, noting location and condition (if possible) of well, septic tank, soil absorption system, pit privies, and other sanitary facilities; lot dimensions; slope; roof and surface drainage; evidence of past and present malfunctions; and other relevant information such as algae growth in shoreline areas; and

- preliminary conclusions on maintenance, repairs, applicable water conservation methods, and types and location of replacement facilities or upgrading measures for existing wastewater systems.

The effectiveness of partial sanitary surveys may be limited by the unavailability of properly trained personnel. Optimally, the surveyor should be a sanitarian, engineer, soil scientist, or other professional knowledgeable of on-site systems, their uses, and their limitations. In the absence of these persons, nonprofessional personnel could be trained in a relatively short period to be competent in the conduct of sanitary surveys. It should be impressed upon these personnel that straightforwardness with the public and objectivity in survey data interpretation is just as important in sanitary surveys as is knowledge of public health, soil science, and sanitary engineering.

An example of the sanitary survey form used by U.S. EPA during its preparation of the Seven Rural Lake EIS's is included in Appendix B.

### b. Representative Samplings

TRD II-C

Representative samplings are intended to enhance the conclusiveness of Phase II field investigations. Representative sampling conducted in support of partial sanitary surveys can identify previously unrecognized but documentable water quality and public health problems, thereby verifying the number of "obvious problem" lots. Representative sampling may involve one or more of the following parameters:

- Seasonally or permanently high water table. Selected lots suspected during Phase I of having seasonally or permanently high groundwater elevations should be augered to a depth of five or six feet to resolve the uncertainty.

  Where a seasonally high water table is suggested and sampling has to be conducted during dry weather, soil mottling may offer an indication of high groundwater elevations. In this case, a soil scientist with knowledge of local soils should be involved.

TRD II-H

- Groundwater flow. In areas served by on-site systems, the safety of private well water supplies, small springs, and surface waters may depend on the direction and velocity of groundwater flow. This information is not likely to be available during Phase I. Phase II efforts will generally be limited to evaluation of well logs and other available data and to rapid surveys in lakeshore areas. More intensive work may be useful in some communities.

EIS II-A-2-a
IV-E-1
VI-A-1

- Well water contamination. Where contamination by on-site systems of aquifers used for drinking water is suspected, sampling of existing wells is encouraged. Parameters that may be analyzed include nitrates, chlorides, fecal coliforms, surfactants, and whiteners. Samples should only be taken from wells that are properly protected from surface runoff and other sources unrelated to wastewater. Sampling must be accompanied by inspection of the well.

EIS IV-E-1

- Shallow groundwater contamination. Groundwater pathways to surface water bodies and unconfined aquifers may be sampled in areas where drainfield to water table distances are less than state standards.
- Soil permeability. Soil augering to a depth of a selected number of feet should be conducted by a qualified soil scientist on or near lots suspected of having very slow or very rapid permeability. Percolation tests will not usually be necessary.

The value of representative samplings data can be increased through extrapolation to similar areas within the community. For example, well logs and soil borings contain valuable information about soil materials and water table elevations. Following interpretation by soil scientists and hydrogeologists, these data can be related to specific soil map units, thereby supporting predictions for all areas containing the same map units.

TRD XVI-D The scope of representative sampling should depend on the conclusiveness of prior decisions to adopt the optimum operation approach. If it is clear prior to Phase II that this approach will be adopted, sampling at a level equivalent to detailed site analysis should be considered. If the decision has not been made, then the scope should be limited to sampling that will evaluate typical performance problems, not all of the problems revealed by the sanitary survey.

## 3. RETENTION AND FUTURE ANALYSIS OF NEEDS DOCUMENTATION DATA

Data describing the type, extent, and frequency of water quality and public health problems associated with on-site systems are collected continually at the local level by sanitarians, soil scientists, and engineers. When augmented by empirical soils and performance information, this needs documentation data base provides an invaluable tool for evaluating the cause of on-site system failures and for predicting future system performance. As such, this data base enables local officials to make informed decisions on technology selection and system permitting. Obviously, this suggests that needs documentation data collected during Phase I and Phase II should be retained for future decision-making. Available soils and performance data could be assessed and tabulated for inclusion in an empirical data base during the winter months when field investigation efforts and therefore time and personnel constraints are minimal.

EIS II-A-3-c The economic justification for the collection and use of empirical soils and needs documentation data at the local level should be based on 1) a moderate to high level of need based on density of development, on-site system failure rate, and sensitivity of water resources and 2) the fact that cost savings from optimum operation of existing systems far outweigh the costs associated with data collection. The optimum operation approach is based upon the collection and use of empirical information. It is frequently more cost-effective than construction of new centralized facilities that do not require this information.

EIS I-B-3 To maximize the utility of needs documentation and empirical data for future decision-making, this EIS recommends that a standardized information system be developed that will facilitate statistical correlation of soil characteristics, other determinants of performance (system age, design, maintenance, etc), and on-site system performance itself for use by local, regional, and state governments in Region V. The objectives of this effort would be two-fold. First, retention and tabulation of empirical/needs documentation data are essential to the long term success and low cost of optimum operation alternatives. A standardized format and local storage of the data (by fire numbers, segments, etc.) could facilitate extrapolation of information from one area to another within the community. Second, use of the same standardized system by state governments would enable empirical needs documentation data to be extrapolated from one county or region to another. As discussed in Section I-B-3, transferability of needs data would enable state officials to manage information gaps that may include small waste flows state of the art, costs, and management techniques.

This EIS recommends that Region V, Headquarters, the Office of Research and Development, and other divisions of U.S. EPA discuss among themselves and with concerned state agencies in Region V the best means of developing and utilizing standard formats for the collection, analysis, storage, and retrieval of needs documentation data developed with Construction Grants funds.

## E. DESIGNING AN OPTIMUM OPERATION ALTERNATIVE

EIS I-A

The Seven Rural Lake EIS's recommended (wholly or in part) optimum operation of existing on-site systems, upgrading or replacement of failing systems, and construction of cluster systems where on-site remedies are not workable or cost-effective. The varied range of project sizes, water quality problems, and site conditions suggests that these methods should work well in the great majority of unsewered rural lake areas. They can usually offer a substantial savings in operation and maintenance, as well as capital costs, over new centralized facilities, while normally providing comparable public health and water quality benefits.

For these reasons, Figure II-C-2 and this section concentrate heavily on community development of an optimum operation alternative. They do not specifically discuss the steps for development of centralized alternatives that may proceed in concert with it. However, the principles of needs documentation, sequencing, and system selection reflected in Figure II-C-2 and the Region V Needs Documentation Guidance (Appendix A) will, if diligently followed, lead just as surely to a conventional system or a modular combination of centralized and small waste flow technologies if that is what is needed, feasible, and cost-effective.

The sequence of data collection steps shown in Figure II-C-2 and discussed in Section II-D was designed to support increasingly detailed steps in the screening and development of optimum operation alternatives. The sequence of data collection steps and parallel alternatives development steps are:

| Data Collection | Alternative Development |
|---|---|
| Phase I Needs Documentation | Technology Assumption |
| Phase II Needs Documentation | System Selection |
| Detailed Site Analysis | Facilities Verification |

The purpose of sequencing these efforts is to build decision points into the planning process. If at various points, "no action" or centralized alternatives are demonstrated to be better than optimum operation, subsequent planning efforts can be redirected as appropriate. If at an early stage of needs documentation it becomes clear that the optimum operation approach is appropriate, then the sequence is further simplified. These and other factors will modify the actual sequences of steps taken in a given community. Such factors are discussed and examples of modified sequences are presented in Technical Reference Document XVI-D, "Alternative Construction Grants Procedures for Small Waste Flow Areas" reproduced in Appendix A.

With or without Federal funding the approach outlined here will save time and effort. In general, the development, costing and evaluation of alternatives proceed at a pace only slightly behind that of needs documentation, and at a comparable level of detail.

The following sections discuss the alternative development tasks as they relate to the key data collection steps.

## 1. PHASE I

The areawide information obtained during Phase I of needs documentation is also instrumental to the early phases of alternative development. Before the end of Phase I it should be clear: (1) whether any action is needed, (2) how segments should be delineated, (3) whether centralized or small waste flow approaches are needed, and (4) which approach is likely to cost more.

EIS II-F-3
II-F-1

Phase I data should suffice to make a general assessment of the need, cost, and feasibility of centralized and small waste flows approaches. The costing techniques need not be detailed since on-site technology selection for each residence would not yet take place. Decisions to proceed with development of optimum operation alternatives will usually be based on the feasibility of continued use of existing systems since cost comparisons at low and moderate housing densities will nearly always favor continued use.

### a. Segment Delineation

EIS II-H

After a review of existing data suggests the need for some response (see II-D), delineation of segments is the first task of alternative development. Unless existing data is extremely limited, this can be done from available data and community surveys that do not require access to individual lots.

This task uses information such as:

- housing density
- failure rates (and kinds of failures) for existing systems
- soil types
- groundwater conditions
- types of systems in use

and other relevant information to divide the study area into segments with similar characteristics.

Segmentation begins alternative development by organizing site-specific data. It should at least divide existing sewered areas and those that obviously require sewers from those areas where the performance and density of existing on-site systems warrant consideration of the optimum operation alternative.

### b. Screening Alternatives by Segment

Once the segments are defined and Phase I data collection (see II-D) is completed, it becomes possible to screen alternatives by segment. The intent of this task is to:

- exclude from further planning those segments with limited need, and
- recognize specific conditions common to individual segments, such as housing density, types of facilities in use, nature of water quality problems, and lake trophic conditions (see Chapter IV-E-2), which require continuing attention as decisions are made.

### c. Technology Assumptions

Available data and Phase I data collection may not support accurate cost-effectiveness analysis. Nevertheless, this is an appropriate time to make a rough determination of those segments that must have off-site treatment, those that require small waste flows management, and those that are suited for "no action." To do this, the least detailed type of alternative description, technology assumptions, will suffice. For optimum operation alternatives, technology assumption is an informed estimate of the overall number and types of replacement and upgraded facilities by segment or by similar groups of segments. This can be done by an appropriate match of on-site technologies to segment conditions and problems.

First, the overall rate of replacement and upgrading is estimated as indicated by Phase I data. Because this data is not detailed, the estimate should be somewhat higher than actually documented. Estimates can be made for individual segments or groups of segments where some action is indicated by the data.

Next, a mix of replacement and upgrade technologies is assumed as indicated by the types of failures documented and by conditions in the segments. At this stage the accuracy of the mix is not critical nor is the selection of specific technologies for individual sites. The intent of technology assumptions is to prepare a basis for preliminary cost comparisons between sewered and small waste flow approaches.

### d. Cost Analysis

After the technology assumptions are made, two different sources of data for cost comparisons are available: the cost relationships developed in the Cost Variability Study (see Sections II-F-1 and F-2) or locally developed cost data. A cost comparison of sewered and small waste flows technologies will produce a preliminary indication of which will be more cost-effective, focus attention on serious need areas, and guide the planning of Phase II data collection. Absolute accuracy of cost analysis at this point is not critical since any segment for which sewering is not incontestably cost-effective should be included in Phase II data collection.

## 2. PHASE II

Phase II takes the project through completion of all remaining facilities planning, including development of a proposed action. If properly developed, Phase II data will allow more precise selection and costing of necessary facilities, especially for the optimum operation alternative.

As Phase II data acquisition proceeds, it becomes increasingly possible to estimate both needs and possible remedies, until by the completion of facilities planning we also have a preliminary treatment recommendation for surveyed sites. Phase II data collection efforts should seek information to assess the reasons for existing system failure as well as to recommend appropriate solutions.

### a. Systems Selection

After Phase II needs documentation work and the reclassification of developed lots, the measures needed to remedy failures become increasingly clear. New information generated during the partial sanitary survey and representative sampling should improve the facilities planner's understanding of the nature and cause of specific on-site system problems. With this improved understanding, the planner should review and modify his technology assumptions. In addition, preliminary treatment recommendations might be made for surveyed properties. In cases where Phase I and Phase II data are particularly comprehensive, preliminary treatment recommendations might be possible for most or all properties in the optimum operation service area. Preliminary treatment recommendations should be contingent on detailed site analysis such as described in Section II-A-4. EIS II-A-4

At a minimum, systems selection should document:

- descriptions of the common type of on-site system failures in the area with known, on-going failures located on a map of the planning area,
- analysis of the site, usage, or design factors which cause the failures,
- technology selection criteria which relate local problems and their causes to feasible structureal and non-structural solutions,
- the estimated number of on-site systems requiring upgrading, replacement or renovation, and
- the approximate mix of methods estimated to be required to correct failures.

### b. Alternative Description

System selection is the core of a final optimum operation alternative. Other elements need to be added:

- EIS II-B-1 TRD I — Septage Disposal. Estimated quantities of septage, feasible treatment methods, final disposal sites, and collection equipment must be described.
- EIS III-C-3 TRD VI-A — Administration, Operation and Maintenance. The management services necessary for the successful long-term performance of selected systems need to be identified on a preliminary basis. Both necessary and elective services should be included regardless of whether provided by the applicant or by others.
- EIS II-F-3 — Present Worth. All direct costs for the alternative over the 20-year design period will be estimated and converted to their present worth.
- EIS II-F-4 — Average Annual Homeowner Cost. See Section II-F-4.
- EIS III-B-4 — Detailed Service Area Delineations. The potential service areas delineated on the basis of Phase I information may be refined to reflect Phase II decisions. If some services will be provided to some small waste flow segments but not others, these differences may be described and shown graphically as different service areas.

### c. Proposed Action Description

Selection of one alternative to be the facilities plan's proposed action involves environmental assessment, public review, coordination with grant and regulatory agencies and, finally, a decision by the applicant.

If an optimum operation alternative is selected for part or all of the planning areas, three items will be needed in addition to those included at the final alternative stage:

- Applicants capabilities. The applicant must certify that funded facilities will be properly operated and maintained. To do this it should:
  - 40 CFR 35.2104 — Demonstrate the legal, institutional, managerial and financial capability to ensure adequate building and operation, maintenance and replacement of the facilities.

40 CFR 35.2110

- Provide assurance of access to on-site systems at all reasonable times for such purposes as inspection, monitoring, building, operation, rehabilitation, and replacement.

40 CFR 35.2106

- Submit a draft plan of operation that addresses development of an operation and maintenance program and manual, an emergency operating program, personnel training, a budget for operation and maintenance, operational reports, and laboratory testing needs.

- Availability of Cluster System Sites. If small scale off-site treatment appears to be necessary, the availability of potential treatment sites should be investigated. Where the need for sites is contingent on detailed site analysis of existing on-site systems, availability does not have to be conclusively demonstrated at this point.

EIS III-I

TRD VIII-B

40 CFR 35.2140

- Proposed User Charges. The "average annual homeowner costs" estimated for final alternatives include private costs and do not recognize different user classes. Based on decisions made for the management program, the publicly-funded parts of the proposed action's average annual homeowner cost should be allocated as the applicant desires. The method of user charge recovery and the estimated amounts that users will pay will be described in the final facilities plan. A user charge system will have to be developed which is adequate to produce revenues required for the operation, maintenance and replacement of funded facilities. The user charge system must also include an adequate financial management system that will accurately account for revenues generated by the user charge system and expenditures for operation and maintenance, including replacement.

EIS II-D-2-a

Individual states may require that treatment recommendations be made on a preliminary basis for each property in optimum operation service areas. This EIS suggests that any preliminary treatment recommendation be based on available data and on on-site sanitary inspection (see Section II-D-2-a) at a minimum.

## 3. FACILITIES VERIFICATION AND DESIGN

The next step, facilities verfication, transforms these tentative facilities plan technology selections into actual house-by-house recommendations. For a Construction Grants project it allows Step 3 funding and actual bidding, or actual bidding for a self-help project. It includes the selection of type, locations and design parameters for all on-and-off-site treatment facilities. It is modified only by last-minute changes due to completely unforeseen factors that might turn up during actual construction.

This level of certainty requires hard information. The sanitary survey of developed properties must be completed. There will be detailed site analysis for systems with direct discharges, documented failures, surface malfunctions, recurrent backups, groundwater contamination, or potential problems (unacceptable design or similarity with failed systems). Figure II-A-1 shows how this work is shaped by the type of problem indicated.

This data will probably allow final cost comparisons of particular facilities for individual homes or groups of homes. Where on-site facilites will work well, little comparison is needed. Marginal on-site systems with a high risk of poor performance will require more detailed comparison; this will weigh administrative, monitoring, and replacement costs against savings resulting from staying with higher risk facilities. Careful cost comparison will also be needed where the choice is between a few high cost on-site facilities and widespread off-site treatment.

In practice most on-site facilities can be designed in the field at conclusion of the detailed site analysis just described. The site or neighborhood cost-effectiveness analysis reviews these individual field decisions from a community perspective, seeking economies in management services and facilities costs.

Off-site facilities design will usually require more site work. Because the need to go off-site may have been clear since the end of facilities planning, this additional work may have already been completed. In some special cases the need to go off-site will not be clear until the completion of the facilities verification studies.

Off-site facilities and non-standard on-site facilities likely will require design drawings and specifications that take time for preparation, review and regulatory approval. In contrast, conventional on-site facilities can be described by standard design packages. With standard design packages, review and approval may be accomplished quickly through concurrence by local health officials. Where much of a project consists of standard on-site facilities, grantees and state grant administrators may wish to establish a separate track for their bid document preparation and construction.

## 4. BID DOCUMENTS FOR COMBINED STEP 2 AND 3 GRANTS

CWA 203(a)

Proposed actions based on the optimum operation alternative will qualify in many communities for single grants to cover both design and construction costs. Combined Step 2 and 3 grants are intended to simplify and speed up the grants process for small communities. Communities of 25,000 or less population are eligible to receive combined grants if the costs of decision plus construction will be less than $8 million, and the grant is for an entire project, not just a part of the overall project.

Typically, design, bid document preparation, contract award and construction are separate steps completed in this sequence. When on-site facilities are to be constructed, however, disruption of property and intrusion on privacy might be minimized by following facilities verification (design) immediately with construction. This would also speed up abatement of failures. To accomplish this, bid documentation preparation and contract award would have to precede facilities verification. For this to work, contractors would submit unit prices and quantity discounts for typical facilities. Payment to contractors would be based on their quotations. In addition to the bidders' experience and capabilities, selection of contractors could be based on their total estimated price and unit price bids, for the mix of facilities included in the optimum operation alternative.

This method of contracting would be aided by the development of standard design packages for a wide range of technologies.

## 5. BID DOCUMENTS FOR SEPARATE STEP 2 AND STEP 3 GRANTS

CWA 203(a)

Communities over 25,000 population or projects with design and construction costing more than $8 million will not qualify for combined grants. The parts of their projects using the optimum operation alternative will have to follow traditional grant and procurement procedures. Applicants may be able to speed up abatement of failures by segmenting centralized from small waste flow portions of a project so that each part may proceed at its own rate. (The use of the word "segmenting" here is different from its use in regard to identifying parts of a community for environmental contraints evaluation, needs documentation and alternative development.)

## F. COST ANALYSIS

### 1. COST VARIABILITY STUDY

TRD IV-A

Facilities plans for small communities will consider alternatives ranging from on-site upgrading and repair to small-scale collection and treatment to centralized collection and treatment. Many of the technologies to be considered are alternative or innovative. Rules of thumb regarding cost competitiveness between these technologies and conventional centralized technologies have not been developed because so few cost-effectiveness comparisons between them have been completed.

To provide facilities planners with some of these rules of thumb, the present worths of on-site, small-scale and centralized approaches have been estimated, presented in cost curves and compared graphically. A large number of present worth estimates were generated, reflecting the influence of key factors on the cost competition between different technologies. The factors that were varied in this exercise are listed in Table II-F-1. Density of development, expressed as number of residences per mile of potential collector sewer, was selected to be the independent variable on all cost curves. Environmental factors were associated in reasonable combinations in eight scenarios. The effects of growth were studied by preparing all analyses at 0% and 50% growth over a two-year period. Results are expressed as present worth per household at the end of the 20-year design period. 1980 costs were used in this analysis (Engineering News Record Index = 3260). The discount rate used for the present worth calculations was 7-1/8%, the Water Resources Council recommended rate at the time of the analysis (1980). Other design and cost assumptions are reported in Technical Reference Document IV-A.

C.11.&12.

TRD IV-A

The technologies evaluated are also listed in Table II-F-1. The present worth cost of each technology was calculated at each of four densities, for each of eight scenarios, at 0% growth and at 50% growth. A mix of upgrade and replacement technologies was selected for on-site systems appropriate to the constraints incorporated into each scenario. On-site replacement/upgrade rates of 10%, 20% and 50% were costed separately for each scenario. The mixes incorporate increasingly elaborate and costly technologies as the rate of replacement increases, reflecting an assumed relationship between failure rates and environmental conditions.

The per house present worth costs are presented in cost curve graphs and in tabular format in Technical Reference Document Chapter IV-A. The cost curves are presented in three combinations:

- technology curves - each sewered technology and on-site technology mix is portrayed on a graph with eight curves, one for each scenario;
- scenario curves - for each scenario, curves are included representing the on-site technology mixes and competitive sewer/treatment combinations;
- cost-effectiveness curves - also based on scenarios, only the cost-effective means of collection, centralized sewering and treatment, land application and small-scale sewering, cluster collection and treatment, 10% on-site treatment, 20% on-site treatment and 50% on-site treatment are shown.

The technology curves show the cost consequences of environmental constraints on specific technologies. Given local information on the topography, groundwater conditions, depth to bedrock and on-site system failure rates, the facilities planner can make preliminary judgments on which environmental constraints should be reflected in subsequent cost-effectiveness analysis.

TABLE II-F-1. FACTORS VARIED AND TECHNOLOGIES CONSIDERED IN THE COST VARIABILITY STUDY

| Environmental Factors | Values |
|---|---|
| Topography | Flat<br>Optimal (8' average depth of cut)<br>Rough (16' average depth of cut)<br>Rough (necessitates one pump and force main)<br>Rough (necessitates one pump and force main; 50% of houses require grinder pumps) |
| Average Depth of Groundwater | Below deepest sewer<br>6' below ground surface (with flat topography only) |
| Average Depth of Bedrock | Below deepest sewer<br>2' below ground surface<br>6' feet below ground surface |
| Soil Unstable | Not a problem<br>Imported fill needed to replace 1,000' of peat soil |
| **Developmental Factors** | |
| Growth Rate | 0% in 20 years<br>50% in 20 years |
| Housing Density | 25, 50, 75, 100 houses per mile of potential sewer for 0% growth rate<br>39, 75, 113, 150 houses per mile of potential sewer for 50% growth rate |
| **Technologies** | |
| Collection Only (assumes collection system and treatment facilities are in place nearby) | Conventional Gravity Sewers<br>Small Diameter Gravity Sewers<br>Pressure Sewers with Septic Tank Effluent Pumps<br>Pressure Sewers with Grinder Pumps |
| Centralized Treatment (transport and treatment costs derived from engineering studies for Seven Rural Lake EIS's) | Four sewering methods |
| Small-scale Land Application | Spray Irrigation<br>Overland Flow<br>Rapid Infiltration<br>Four Sewering Methods |
| Cluster Systems | Four Sewering Methods |

The scenario curves and the cost-effectiveness curves can be used to identify cost-effective technologies given local environmental constraints and housing densities and assuming that one of the scenarios fairly represents local constraints.

Two of the cost-effectiveness curves are presented in Figures II-F-1 and II-F-2 to illustrate the considerable effect that density, growth rate, and environmental constraints cumulatively can have on cost competition between the major technology options.

Intersections between lines represent trade-off points between technologies. The densities below trade-off points can be referred to as trade-off densities.

Figure II-F-1 represents conditions favorable to conventional gravity sewers: high growth rate, no constraints due to groundwater, bedrock or unstable soil, and favorable topography allowing a minimal average depth of excavation. Several points can be drawn from this graph:

- Small diameter and conventional gravity sewers are highly competitive throughout the density range with conventional gravity sewers becoming cost-effective above 65 homes/mile.

- Because of economies of scale, centralized treatment is highly preferable to cluster systems at higher densities and still competitive at low densities. [However, cluster systems may still be an important element of small waste flows alternatives that are cost-effective compared to sewering in a community-wide comparison.]

- Rapid infiltration, the least expensive of the three land application methods evaluated, is still more expensive than cluster systems or centralized treatment. Convergance of the rapid infiltration curve with cluster and centralized curves at low density is due to the finding that very small scale land application systems (surface application) are impractical at flows below 20,000 or 30,000 gallons per day. It was assumed that a sufficient number of nearby one-mile segments would discharge to a single land application site, thereby providing economies of scale at lower densities not achievable with other sewered technologies.

- Only centralized treatment/collection and collection only are competitive with replacement/upgrading of on-site systems at or below 50% replacement levels.

- Collection only is cost-effective compared to 50% replacement throughout the range of densities and becomes competitive with 20% replacement at 100 homes/ mile. This comparison is biased somewhat in favor of collection because operation and maintenance costs for treatment and transport of the wastes were not included. The low costs for collection only are achievable only where the area in question is adjacent to existing sewered areas having existing transport and treatment capacity for the 20-year design period.

Whereas Figure II-F-1 reflects conditions that are favorable for sewering, Figure II-F-2 reflects conditions that are adverse: no growth, groundwater at 6' depth in porous soils, flat topography, and peat soils underlying 1,000' of the one-mile segment. This is a setting typical of many lakeshores. Comparisons with Figure II-F-1 include:

- The cost-effective sewering method throughout the density range is pressure sewers.

## COST-EFFECTIVENESS CURVES
Scenario 1
50% Growth

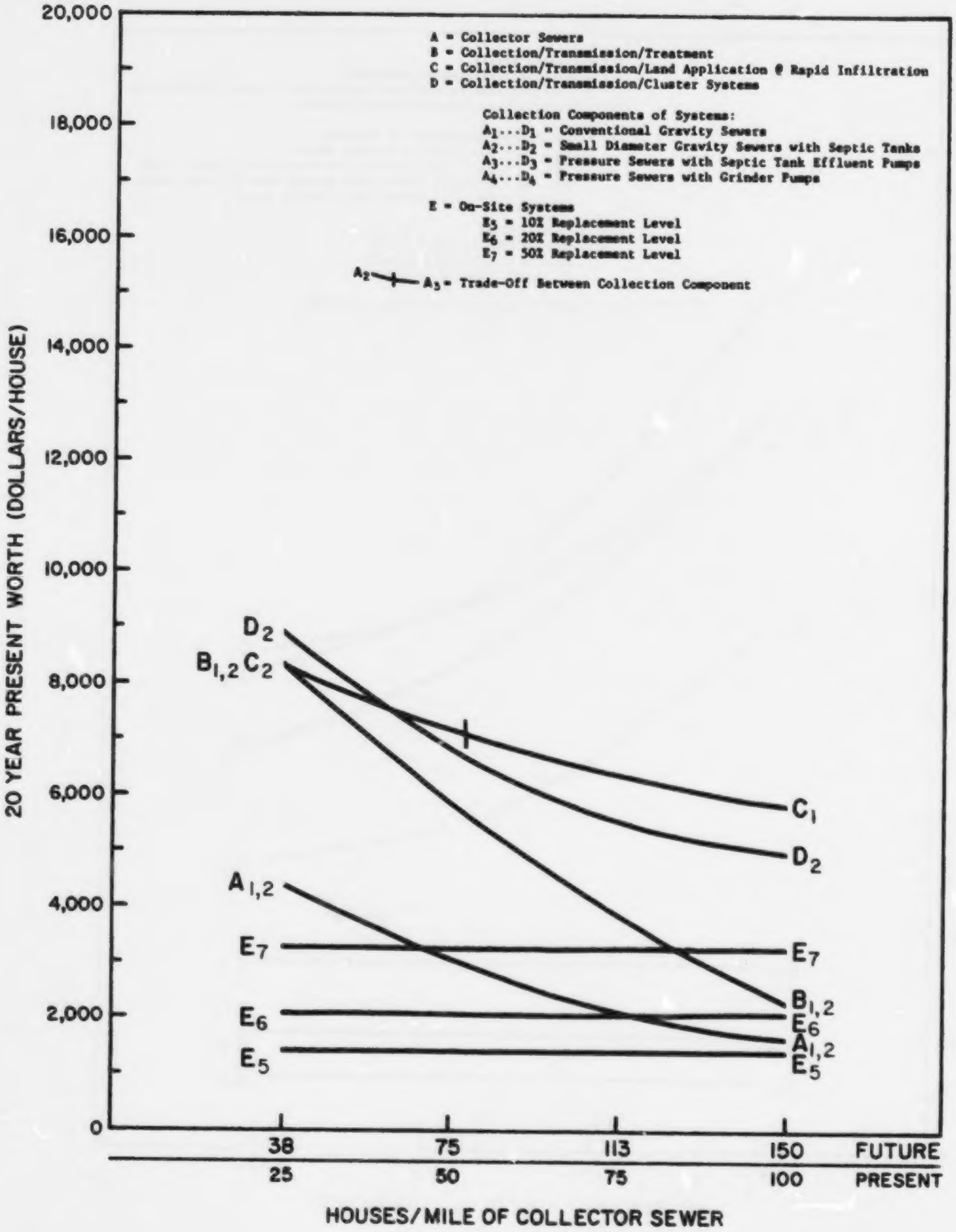

FIGURE II-F-1. COST-EFFECTIVENESS CURVES FOR ON-SITE SMALL SCALE AND CENTRALIZED TREATMENT ALTERNATIVES FOR SCENARIO 1; 50% GROWTH

COST-EFFECTIVENESS CURVES
Scenario 4
0% Growth

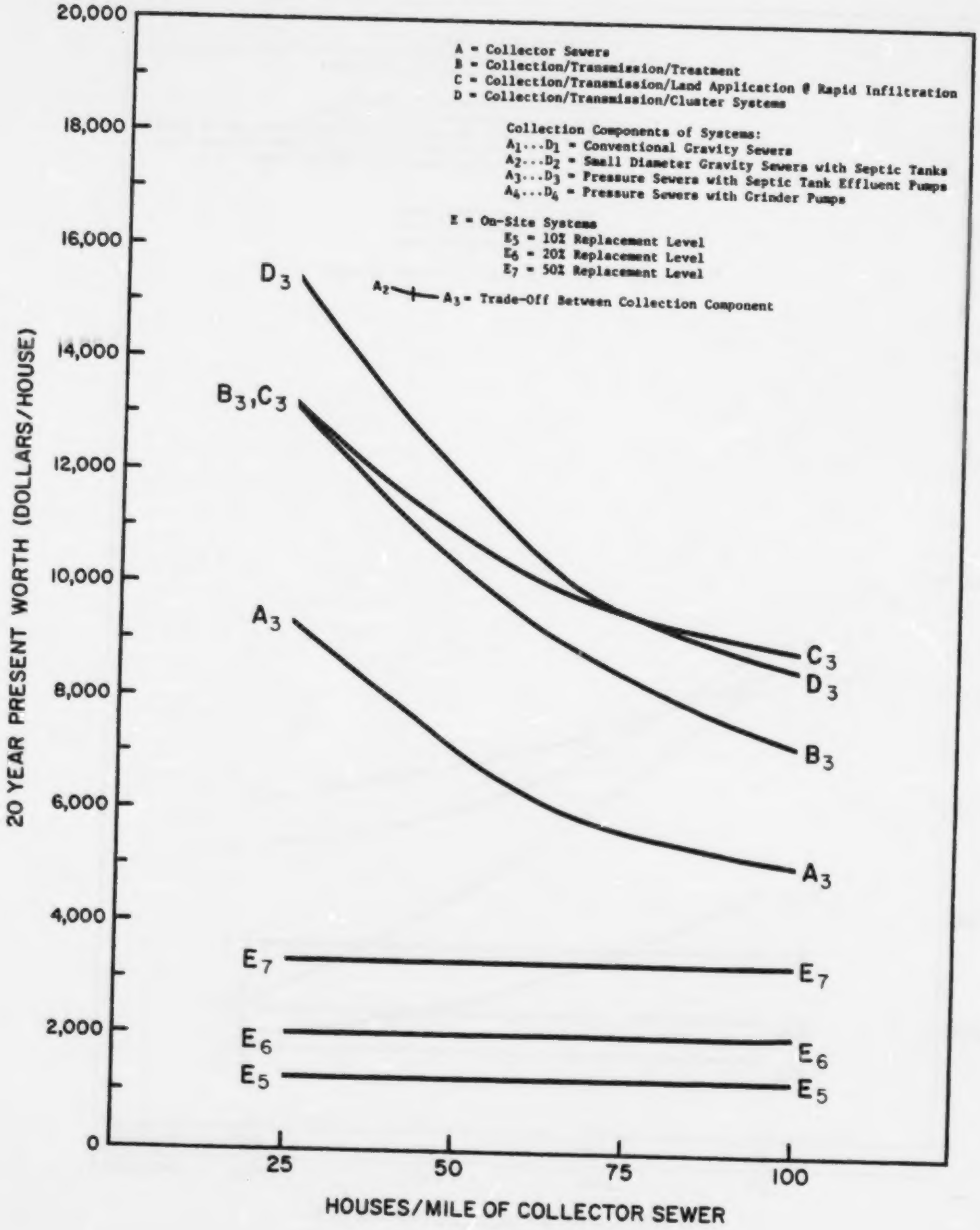

FIGURE II-F-2. COST-EFFECTIVENESS CURVES FOR ON-SITE SMALL SCALE AND CENTRALIZED TREATMENT ALTERNATIVES FOR SCENARIO 4; 0% GROWTH

- At no point is sewering competitive with on-site replacement/upgrading. (This is also true at 50% growth for this scenario although the difference in present worth is reduced.)

- The ranking of off-site treatment methods is the same as in Figure IV-F-1 since it was assumed that conditions at the treatment sites were unaffected by conditions in the collection area.

Decisions to sewer or not will be determined ultimately by two analyses: the feasibility of abating failures of on-site systems by replacement or upgrading, and cost-effectiveness comparisons. Worst case comparisons favoring sewers can be made by examining the trade-off densities at which the most costly on-site technologies (50% replacement) equal the most cost-effective sewering technologies for each scenario. Table II-F-2 shows the trade-off densities for the eight scenarios and the several treatment options considered in the cost variability study at 0% and 50% growth.

The trade-off densities shown in Table II-F-2 for complete collection, transport and treatment systems are high enough that the decision to sewer may be made on the basis of on-site feasibility as well as cost. At lower growth rates and lower replacement rates, on-site feasibility will increasingly become the determining factor in this decision.

Cost-effectiveness will likely remain the decisive factor in sewering decisions when existing sewer systems are nearby. Except where constraints to sewering are severe, the results indicate that sewering in this case will be cheaper than high rates of on-site replacement and upgrading. The cost preference for sewers, however, changes rapidly as replacement rates decline. Even for the most favorable scenario for sewering, on-site replacement rates below 15% will still be cost-effective at high housing densities.

Broad conclusions drawn from the cost variabilility study include:

- Average depth of cut, depth to groundwater and depth to bedrock can be decisive factors in cost-effectiveness comparisons between sewering and on-site upgrading and replacement. Where these constraints might be expected, cost analysis must include costs of measures to overcome them.

- Where extension of existing sewer systems is being compared to on-site solutions, costs to overcome constraints to sewering become relatively more important. Field inventories of these constraints and determination of local excavation, blasting and dewatering costs may be necessary for preparation of valid cost-effective analysis.

- Rate of replacement for on-site systems is much more significant to cost-effectiveness than the mix of technologies except where a large proportion of very expensive replacements are necessary. At low densities or where constraints to sewering exist or when expensive replacement systems do not appear to be necessary, cost-effectiveness analysis will not depend on an exact prediction of the on-site facilities required.

EIS V-A-4-d

- Where existing sewer systems are not available nearby, decisions to sewer or not will be based primarily on the feasibility of abating on-site system failures with on-site methods. Analysis of successes of prior repairs and pilot studies of innovative technologies are, therefore, going to be more productive in facilities planning than accurate determinations of the mix of replacement technologies.

## 2. COST CURVE ANALYSIS

The relationships between environmental constraints, development variables and technologies developed by the cost variability study can be used qualitatively or quantitatively in facilities planning for unsewered areas. Some of the qualitative conclusions that can be drawn from the cost curves are listed above. Review of the 132 graphs and accompanying tables in Chapter IV-A of the Technical Reference Document will suggest numerous other conclusions.

EIS IV-H

The cost curves might also be used to make preliminary decisions on what alternatives to consider (in the Plans of Study accompanying applications for Step 1 grants) and on preliminary service area delineations (with input from available needs documentation data and community surveys). To do this, the developed parts of the facilities planning area are segmented. The environmental and developmental characteristics of each segment and proximity to existing collection systems are noted. Depending on the accuracy of environmental and developmental information available and appropriateness of the scenarios to local conditions, the curves can help make decisions to sewer or not in cases where cost differences are great enough that improved data would not change the conclusions. Use of the curves can also indicate what types of data would most improve subsequent detailed cost-effectiveness analysis.

TABLE II-F-2. TRADE-OFF DENSITIES (IN HOMES PER MILE) ABOVE WHICH OFF-SITE FACILITIES ARE COMPETITIVE. BASED ON 50% REPLACEMENT OF ON-SITE SYSTEMS AT 0% AND 50% GROWTH.
(Revised from the Draft EIS)

| Scenarios | Collection only | | Centralized treatment | | Land application | | Cluster system | |
|---|---|---|---|---|---|---|---|---|
| | 0% | 50% | 0% | 50% | 0% | 50% | 0% | 50% |
| 1 No constraints 8' adc[1] | 45 | 69 | 93 | 125 | - | - | - | - |
| 2 No constraints 16' adc | - | - | - | - | - | - | - | - |
| 3 Steep topography 1 pump | 57 | 81 | - | 137 | - | - | - | - |
| 4 Flat; 6' to groundwater; peat[2] | - | - | - | - | - | - | - | - |
| 5 Flat; 6' to groundwater | - | - | - | - | - | - | - | - |
| 6 Steep topography; 1 pump; 6' to bedrock | 77 | 113 | - | 150 | - | - | - | - |
| 7 Flat | 75 | 109 | - | 144 | - | - | - | - |
| 8 Steep topography; 2' to bedrock; 50% of houses need grinder pumps | 76 | 111 | - | 138 | - | - | - | - |

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[1] adc = average depth of cut.
[2] Imported fill needed to replace 1,000' of peat soil.
- Greater than 150 homes per mile.

Use of the cost curves beyond very preliminary analysis is not warranted for the following reasons:

- Unit costs were based on the best data available. Some units costs such as cost per house for detailed site analysis are based on educated judgment but are not yet backed by experience. Other unit costs are subject to local and regional variability which was not analyzed for its effect on the results.
- The curves have not been tested yet by applying them to actual situations, then comparing the costs to detailed cost-effectiveness estimates or bid data.
- Not all variables which may significantly affect the outcome of cost comparisons have been studied. Most cost-imposing factors have been incorporated in the present worth estimates (with the notable exception of O&M for transport and treatment in the "collection only" curves) but only the factors designated have been varied.

## 3. COST-EFFECTIVENESS ANALYSIS

The main consideration in performing a cost-effectiveness analysis for combinations of centralized and small waste flows options is the inclusion of all costs such that alternatives are comparable. Costs that are common to all alternatives can usually be omitted from the cost analysis without affecting the results. For example, in comparing one centralized alternative to another, costs of items such as collection sewers, transmission lines, and house sewers do not affect the outcome of the analysis and can therefore be omitted. However, when a small waste flows alternative is incorporated into the analysis, the omitted costs are no longer common to all alternatives and must, therefore, be included. Examples of costs that should not be omitted from an analysis comparing centralized to small waste flows alternatives include the following:

- Design
  - detailed site analysis and facilities verifications for optimum operation alternatives
  - hydrogeologic studies for cluster and land application facilities
  - design and specifications for conventional facilities
  - evaluating and permitting future on-site systems
- Installation
  - flow reduction devices
  - house sewers and connections
  - house plumbing modifications
  - monitoring wells
  - future on-site systems
- Abandonment
  - on-site systems
  - obsolete treatment plants (include any salvage benefits)
- Operation
  - monitoring program
  - on-site system inspection
  - energy savings from flow reduction program
  - income from crop production in land application alternatives

EIS II-E

Several levels of cost-effectiveness analysis may be useful during planning and design of optimum operation alternatives. The first level is represented by cost curves such as those illustrated in Section 2 above. Cost curve information will be useful in estimating the scope of facilities planning for description in the applicants Plan of Study and will aid the delineation of centralized and small waste flows service areas early in facilities planning.

An intermediate level of analysis would be appropriate, using local costs for specific facilities and first-cut technology assumptions based on Phase I needs documentation. The accuracy of such present worth estimates is to a large degree dependent on the quality and comprehensiveness of Phase I data. However, the validity at this level of analysis of present worth comparisons between centralized and optimum operation alternatives is also dependent on the relative magnitude of the costs. If the difference in cost is great, the ranking of alternatives by cost-effectiveness will probably not be altered by additional data collection or more detailed cost estimation. An example of this level of cost analysis for an optimum operation alternative is presented in Appendix C.

Phase II needs documentation work will provide more detailed information, particularly for estimating work and costs for the detailed site analysis, mix of facilities, and operation and maintenance requirements. This level of analysis will suffice for optimum operation alternatives recommended in facilities plans as part or all of Proposed Actions. System selections made on a preliminary basis (subject to detailed site analysis) for each developed lot should agree with the assumptions of this cost analysis. The format may be similiar to that of the intermediate level analysis as reflected in the example in Appendix D.

EIS V-A-4-d To this point, cost analysis will generally apply to major service areas and entire communities. Completion of the sanitary survey and detailed site analyses will be followed by micro-scale decisions on exactly which facilities will be appropriate for individual lots or groups of lots. When high risk on-site systems are compared to holding tanks, cluster systems or other off-site technologies, micro-scale cost-effectiveness analysis will sometimes be necessary.

Finally, applications for Step 3 construction funds will be accompanied by detailed cost estimates to accompany bid documents. The expected costs of the required management program should also be detailed at this time.

Costs of wastewater facilities for future growth must be included in cost-effectiveness analyses. Future costs are estimated from population projections derived for planning areas. The costs of both centralized and optimum operation alternatives should be based on these projections even though an optimum operation alternative may restrict growth below the projected level.

Although use of cost curves and general costs found in the literature are usually sufficient for preliminary planning, local costs should be used for more detailed comparisons when possible. Construction costs of on-site systems are particularly subject to variations caused by geographic price differences, labor and material costs, and varying haul distances for materials such as stone. To achieve accurate cost estimates (and hence cost-effectiveness analyses) local cost data should be used when possible. For alternative on-site systems that have never been constructed in a particular area, local septic system contractors might provide estimates if presented with plans and a schedule of materials.

## 4. AVERAGE ANNUAL HOMEOWNER COST

Conventional centralized alternatives have very different cash flow characteristics from optimum operation alternatives. Centralized facilities involve a large capital outlay at the beginning of a wastewater facilities project. After the centralized system begins operation, new capital costs are minimal and operation and maintenance costs rise slightly as flows increase and the facilities become older. In contrast, optimum operation alternatives involve much smaller initial capital costs to upgrade or replace existing malfunctioning on-site systems. Additional capital costs are incurred throughout the project life for construction of new and replacement systems.

EIS IV-F-2 Given the diverse cash flow characteristics between optimum operation and centralized alternatives and the need to compare their local costs, a parameter termed the "average annual homeowner cost" is recommended for use by facilities planners. In essence, all local costs, both public and private, in the initial year of operation are divided by the number of residences or dwelling unit equivalents served by an alternative in the initial year. The initial year's costs should include:

- local shares of Step 2 design and Step 3 construction costs amortized at current municipal bond interest rates;
- total private costs for flow reduction devices, house sewers, plumbing changes, etc. amortized at current mortgage interest rates;
- the first year's operation, maintenance, and administration costs, and
- annual reserve fund assessment (often calculated as 10 to 20% of annual debt payment on the local share of public costs).

EIS II-C-1
V-A The eligibility of alternatives' components for U.S. EPA grants determines in part the magnitude of the average annual homeowner cost. The facilities planner should make preliminary judgments on the eligibility for Federal assistance of capital costs for facilities in each alternative. This judgement is based on a review of current U.S. EPA eligibility guidelines and results of needs documentation studies.

EIS I-C-2-a The average annual homeowner cost for alternatives with new sewers will be much higher in many cases than user charges typically levied, owing to the fact that private costs for house sewers and plumbing changes never appear in user charges. Nor do the often expensive frontage and hook-up fees charged to newly sewered users appear. These fees go to retire local capital costs, thereby lowering user charges. Private costs and initial capital recovery charges are real costs to the homeowner and must be reasonably reflected in economic impact analysis, even if they are not included in actual user charges.

EIS IV-F-2 The average annual homeowner cost can be compared to median family income, individual family income, and expressed willingness to pay in order to address economic impacts of various alternatives on local residents.

TRD IV-A
EIS III-I The cost statistics for the community's proposed alternative that make up this economic parameter should be presented individually so that normative judgments can be made by local decision-makers on the distribution of the local costs.

## G. SELF-HELP AND USE OF CONSULTANTS IN NEEDS DOCUMENTATION, FACILITIES PLANNING, AND DETAILED SITE ANALYSIS (New Section)

While the total costs are lower than for centralized alternatives, the proportion of personnel costs to total costs for the optimum operation alternative will be higher. Cost conscious communities will, therefore, concentrate on controlling personnel costs as well as equipment and construction costs. The question of who will do a task right for the least cost can be expected to come up repeatedly. An opportune time to begin answering this question is during negotiations with your facilties planning consultant on his scope of work for needs documentation.

Some needs documentation tasks require equipment or expertise that few communities will have. Examples are septic leachate surveys, aerial photographic interpretation, and geohydrologic analysis. Even your facilities planner may have to subcontract such tasks. But much of the cost for needs documentation and, later, detailed site analysis will be for the less specialized tasks of inspection, water sample collection, record review, base map preparation and data compilation. If an optimum operation alternative is implemented, these are tasks which will be performed routinely in the future. The sooner that the capacity to perform them is developed, the better. Building inspectors, sanitarians, planners, zoning officials and clerks already publicly employed may be able to perform much of the work either with advise from the facility planner or under his technical supervision. Part-time employees might also be hired for temporary but intensive efforts such as sanitary surveys.

Regarding facilities planning, accepted practice is for communities to contract with consulting firms which then prepare the necessary documents and grant application forms. Consulting firms that have working knowledge of Construction Grants program requirements in addition to the necessary planning, engineering and environmental expertise can prepare these documents and forms in a time period and at a cost that most small communities cannot match with available personnel.

EIS IV-D-2

This is not to say that facilities planning should be left entirely to a consulting firm. Obviously, community officials and the public will provide information and opinions that should guide the consultants. But communities can play active roles that will make the selected action more of a local product. Community involvement in needs documentation has been discussed in this section. As discussed in Section IV-D-2 officials may want to examine land use implications of various sewered and unsewered alternatives or even develop land use plans to complement their investment in wastewater facilities. Community offices may also be the best source of economic and demographic information necessary for preliminary designs and cost analysis of wastewater alternatives.

EIS II-E-3

Communities that select the optimum operation alternative may want to take a more active role in the design phase than is normally taken with conventional centralized facilities. The key task in designing optimum operation alternatives is detailed site analysis. (See Section II-E-3) Both the experience of dealing with individual sites and the sense of which facilities will operate locally that are acquired during detailed site analysis will be invaluable for local decision-making long after the consultant has completed his work. Involvement of the individuals who will have long-term responsibilities for managing on-site systems should be seriously considered.

## H. USE OF SEGMENTS IN PLANNING AND IMPLEMENTATION

TRD IX-C

EIS II-F-2

Segmenting a planning area involves systematically dividing the area into subsections according to specific criteria. Planning areas can be divided into segments on the basis of soils classifications or suitability for on-site treatment; housing and land use patterns or neighborhoods; on-site system failure rates; or housing occupancy status (permanent or seasonal). The purpose of segmenting an area is:

- to organize data and calculations (for use in developing alternatives),
- to make the project more understandable,
- to facilitate and schedule subsequent work such as sanitary surveys and detailed site analyses, and

- to evaluate specifically differing socioeconomic, environmental, and land use characteristics.

The use of segmentation during facilities planning allows a more detailed study of individual areas than would be possible by studying the area as a unit. Proper segmentation also provides an appropriate level of data aggregation when details of house by house information gathering are not required, such as during the preliminary planning stages (alternatives development). Additionally, segments ready to proceed with the design step would not have to await state approval of the remainder of the study area. Contracts can be awarded for individual segments or for groups of segments ready for construction. The use of segments, however, does not permit the omission of the detailed site work that must be done prior to facilities verification. The only short-cutting advantage is that individual segments would not have to wait for other areas that are not yet prepared to proceed to the next step.

# Chapter III
# Community Management

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# CHAPTER III

# COMMUNITY MANAGEMENT

"Community management" refers to the management of small waste flows systems by a centralized authority. These may include on-site systems, small cluster systems with subsurface disposal and other small-scale technologies. They can be managed by a wide variety of public or private entities or a combination of these entities. Public entities may include state, regional, or local agencies and nonprofit organizations; private entities may include private homeowner associations and private contractors.

In this chapter, the term "management agency" refers to the authority responsible for managing the systems. A management agency need not be an autonomous agency with the single purpose of managing these systems. It may in fact be charged with other duties and may share management responsibility through agreements with other agencies. The term "management program" in this chpater refers to the broad range of services needed to ensure the proper design, installation, and operation and maintenance of the small waste flows systems.

## A. THE NEED FOR MANAGEMENT

### 1. PAST AND PRESENT MANAGEMENT PRACTICES

As discussed in Section I-C-1, governmental concern with the use of on-site systems has increased in response to perceived and actual inadequancies of early systems. Most governmental authorities now regulate the installation of new systems and can require upgrading and replacement of failing on-site systems. Few authorities, however, have accepted supervisory responsibility for operation and maintenance of on-site systems.

The value of small waste flows systems as a long-term rather than short-term alternative to centralized collection treatment began to be recognized in the 1970's. As a result, communities preparing facilities plans after September 30, 1978, were required to provide an analysis of the use of innovative and alternative wastewater processes and techniques that could solve a community's wastewater needs (PRM 78-9, U.S. EPA, 1978a). Included as alternative processes are individual and other on-site treatment systems with subsurface disposal units (drainfields).

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Legend for Cross-References in Margins

| | |
|---|---|
| EIS I-C-2 | Section of this EIS |
| TRD II-A | Section of the Technical Reference Document published separately |
| CWA 201(g)(1) | Section of the Clean Water Act which necessitates change in the text |
| 40 CFR 35.2110 | Section of the Construction Grants regulations which necessitates change in the text |
| CG 82-6.2. | Section of the program guidance document, Construction Grants - 1982, upon which change was based. |
| C.26. | Comment on the Draft EIS relevant to topic discussed (see Chapter VII) |

All significant changes from the Draft except new sections are identified by underlining.

Preceding page blank

The 1977 Clean Water Act amendments recognized the need for continuing supervision of the operation and maintenance of on-site systems. U.S. EPA Construction Grant Regulations (U.S. EPA, 1978a; U.S. EPA, 1979b), which implement that act, require that before a construction grant for private wastewater systems may be made, the applicant must meet a number of requirements, including:

- certifying that a public body will be responsible for the proper installation, operation, and maintenance of the funded systems;
- establishing a comprehensive program for regulation and inspection of on-site systems that will include periodic testing of existing potable water wells and, where a substantial number of on-site systems exists, more extensive monitoring of aquifers; and
- obtaining assurance of unlimited access to each individual system at all reasonable teams for inspection, monitoring, construction, maintenance, operation, rehabilitation, and replacement.

40 CFR 35.2206 40 CFR 35.2110 PRM 79-8 extended these requirements to grants for publicly owned systems. These policies are continued in recent regulations and guidelines implementing the Clean Water Act.

## 2. COMMUNITIY OBLIGATIONS FOR MANAGEMENT OF PRIVATE WASTEWATER SYSTEMS

Communities have obligations to protect public health and water resources from the adverse impacts of malfunctioning private wastewater systems. Depending on the type and frequency of malfunctions, community obligations may outweigh individuals' rights to constant privacy and absolute possession of private property.

In the most severe cases, the community may require abandonment of privately owned systems. The economic feasibility of most sanitary district expansion is based on their statutory authority to require property owners to abandon existing on-site systems and hookup to new sewers. Under existing state and local law this can often be done even without demonstrating need.

For less severe cases, central community management is a way to minimize this intrusion, avoiding higher costs, landscaping damage, and abandonment of potentially satisfactory facilities. The degree of central management needed is a reflection of the problem itself, and the interference with privacy and property is no greater than that required for maintenance of public health.

Where the public health and water quality impacts of existing on-site systems are acceptable under present management practices, no changes should be necessary in management or in individuals' privacy or property. This is in stark contrast to sewering, where all systems in a given area must connect, whether or not they are working well.

EIS II-C-D Proper assessment of system problems (both type and severity) is the key to determining community obligations while minimizing or eliminating intrusion. Overestimation of systems' adverse impacts may lead to overregulation, increased community costs and reduced community support for management programs. Underestimation of the problems or of management methods needed to deal with them may perpetuate problems to the detriment of the entire community.

EIS II-D The previous chapter discussed ways to measure the impacts of existing on-site systems. On-site system density, failure rate, and the vulnerability of the affected water resources can all affect the level of management needed. When houses are far apart, the probability of a system malfunction harming other residents may be too low for community concern. However, when houses are closer together, the potential for public health and groundwater impacts is greater. At high densities, even with no apparent system malfunctions, impacts on groundwater quality by nitrates and other chemical constituents may be of concern to the community.

The significance of failures relates directly to density. Among denser populations, the potential for adverse impacts is greater. Even where the failure rate is low, densely developed communities have an interest in aggressively preventing future failures. Failures occurring in sparsely settled areas may pose only a marginal threat to the common good. Some individual failures such as plumbing backups are of interest to the general public since disease contracted by one individual can spread to affect many.

Water resources vulnerable to on-site systems include recreational lakes, water supply reservoirs, groundwater aquifers, and other water bodies. The vulnerability of these water resources and their usage by the public will determine threats to the community posed by on-site system problems. Where a eutrophic lake is receiving a small amount of nutrient input from on-site systems, the community obligation to abate the input may be absent. However, when a lake is oligotrophic or is used as a water supply, the community may have to recognize a greater obligation.

Community involvement with existing on-site systems should be limited to assessment of water quality and public health impacts, requiring remedial action where unacceptable impacts exist and implementing management programs to deal with future impacts. Community obligations associated with future wastewater systems should be to regulate their design, installation, and operation and maintenance, in order to limit their potential to affect public health and the environment.

## B. FIVE COMMUNITY MANAGEMENT MODELS

The following five models reflect increasing levels of community obligation for the management of private wastewater systems. When community obligation is low, community management may be limited to initial installation. Increasing community obligations may require management of all phases of system life, including installation, operation and maintenance, failure, renovation and, ultimately, abandonment. Abandonment represents the maximum intervention that a community may take in managing individual systems and should only be taken when community obligations for protecting public health and water resources cannot be satisfied in any other way.

### 1. STATUS QUO ALTERNATIVE

Where community obligation for the regulation of private systems is low because of a low density of systems, lack of problems with the existing systems, and/or lack of sensitive water resources, a community management program may be minimal. Such a program is usually limited to management agency approval of permits, inspection of system installations, and investigation of complaints concerning failures of on-site systems. Management programs such as this are currently in general use throughout Region V.

Under this approach, the homeowner is completely liable for system operation and maintenance, including necessary system repairs. The management agency does not conduct routine inspections to monitor system performance, finance system repairs, consider the use of off-site treatment, or permit the use of experimental on-site designs.

This approach is normally adequate for rural land areas where scattered development, farms, and large tract subdivisions predominate. Construction Grants funding eligibility, however, requires both identified community need and a higher level of community management than this alternative offers.

## 2. OWNER VOLUNTEER

Certain communities may have limited areas of high density, high failure rates, or sensitive water resources, which may raise community obligations for the private systems. In addition to the management program outlined under the status quo model, the community management agency may survey the likely impact areas to identify specific problems. Homeowners would be notified of necessary repairs for their systems, and the community management agency may offer technical and possibly financial assistance to facilitate the repairs.

If a significant enough problem area is identified, the homeowners could receive Construction Grants funds for repair of their systems. The community management agency could apply for and distribute the funds to homeowners whose systems qualify for assistance.

The homeowner would retain both responsibility for system operation and maintenance and liability for system repair. The community management agency's role would be limited to education and technical assistance. For Construction Grant recipients, the community management agency must also insure proper operation and maintenance of the systems. At a minimum this could be accomplished by homeowners periodically providing proof that the system is being properly maintained (that is, by providing pumping records) or by direct inspection and monitoring by the management agency.

## 3. UNIVERSAL COMMUNITY MANAGEMENT

As system density, failure rate, and sensitivity of water resources increase, community obligations for managing private systems shift from voluntary owner participation to universal community management. Under this approach, all wastewater facilities in a community or section of a community would be included in a management program. Wastewater facilities may include on-site systems, cluster systems, other small-scale facilities, or combinations of these small waste flows technologies. Cluster systems and other off-site facilities would only be utilized where difficulties in the use of on-site alternatives require the community to explore all feasible solutions to meeting the community wastewater needs.

The community management agency would assume all of the management responsibilities common to the preceding two models. The management agency would also conduct well water sampling and appropriate monitoring of water resources impacted by the wastewater systems. Depending on the type of wastewater facilities utilized, the level of risk assumed by the management agency, and other factors, the management agency could assume responsibility for performing system operation and maintenance and liability for system repairs.

The community management agency could apply for and distribute Construction Grants funds to property owners for repair of qualified private systems if the owners retain liability. Alternatively, the agency could contract directly with installation firms and recover the local share of the construction costs from owners immediately or as part of periodic user charges. In any case, owners would be assessed periodic fees to cover the costs of management services actually provided.

### 4. COMBINED MANAGEMENT APPROACHES

Sections of a given community may have different wastewater and management needs based on system density, failure rate, and sensitivity of water resources. Centralized wastewater facilities may be in place or required in certain areas, and small waste flows systems may be appropriate for other areas. Owing to varying levels of community obligations, both voluntary and universal management zones may also be present. A management agency should develop specific approaches for each section of the community based on both the projected types of wastewater facilities and community obligations for regulating the private systems. By so doing, the agency can ensure that the program meets each given area's needs.

A possible objection to this approach is the diversity of skills that may be needed. However, there may be sufficient overlap in skills so that agency staff can be maintained at a reasonable number. For instance, sewage treatment plant operators may be able to inspect and repair on-site dosing pump and STEP units. Laboratory personnel can collect and analyze groundwater and surface water samples as well as treatment plant effluent samples. The community may group property owners by type of wastewater system and achieve economies of scale in providing services that would not be achieved by private contractors providing services to owners individually.

Under a multizone management approach, homeowners would be responsible for paying annual fees to support the management services received. Responsibility for operation and maintenance and liability for system failure may vary within each zone.

### 5. COMPREHENSIVE WATER QUALITY MANAGEMENT

Where the sensitivity of water resources is the paramount concern, prevention and control of water pollution need not be restricted to wastewater facilities. The management program in these communities would consist of universal community management of the wastewater facilities and be expanded to identify and control other sources of water pollution. Additional management agency responsibilities may include pollution control assessment and control activities such as:

- non-point source monitoring,
- non-point source control,
- education of residents and visitors about individual pollution control practices, costs, and benefits,
- inventory of the biological resources of the lake and its tributaries,
- research into the chemical, hydrological and biological dynamics of the lake, and
- coordination with other local, state, and Federal agencies on pollution control activities and funding.

Communities with such a high interest in the control of water pollution are also likely to assume direct responsibility for system operation and maintenance and liability for correcting system failures.

## C. DESIGN OF SMALL WASTE FLOWS MANAGEMENT PROGRAMS

TRD VI-H

The process by which a community develops a management program involves six major steps:

1. inventorying factors affecting the design process,
2. making decisions on system ownership and liability,
3. identifying services to be provided,
4. determining how selected services will be performed,
5. determining who will be responsible for providing services, and
6. implementing the management program.

Each is discussed in the following sections.

## 1. INVENTORYING FACTORS AFFECTING THE DESIGN PROCESS

Communities face many choices in designing a management program. The factors influencing the community decisions are of two types. "First-order factors" need to be identified and considered before program design decisions are made. They are existing or projected community characteristics. First-order factors include:

- types of wastewater facilities utilized and proposed,
- expertise available to the community,
- size of the community or management district and number of systems in use,
- available regulatory authority,
- community jurisdictional setting,
- community attitudes toward growth, and
- community attitudes toward public management of private wastewater facilities.

"Second-order factors" are potential consequences of program design decisions. These factors include:

- costs, including initial costs and economic impact of failures,
- environmental impacts, especially impacts on water resources, and
- level of risk assumed by various parties.

The ultimate success of a management program will be measured by these second-order factors.

Most of these factors will directly or indirectly affect decisions for the remaining program design steps.

## 2. MAKING DECISIONS ON SYSTEM OWNERSHIP AND LIABILITY

TRD VI-B

Wastewater facilities may be owned by the individual user, by a community management agency, or by a private organization. User ownership of facilities generally is limited to those located upon his or her property. For off-site systems that serve more than one homeowner, community or private organization ownership is most likely.

Liability involves acceptance of the responsibility for consequences of facility failure. Assumption of liability may involve making necessary repairs and, possibly, paying damages to parties injured by facility failure. Historically, communities have accepted all liability for the failure of centralized collection and treatment systems, with the exception of house connections and plumbing blockages. The liability for individual system failures has traditionally remained with the system owner. With community management of small waste flows systems, there may be advantages to reassignment of the liability for system failure. The assignment of liability to either individuals or a public agency is a matter of choice for the community and its residents.

EIS III-I

A community may assign ownership and liability separately for the wastewater systems. For instance, a management agency may agree to replace, upgrade, or repair privately owned small waste flows facilities that malfunction after Construction Grants projects are completed. In return for accepting this liability, the agency requires that owners pay a reserve fund charge along with other user charges. The reserve fund charge is, in essence, comparable to an insurance premium.

EIS III-E

A possible objection to management agencies assuming liability for future malfunctions is that the economic incentive for owners to use their systems judiciously is removed. This possibility will be weighed against the impacts of prolonged failures should owners not be financially able to make repairs quickly. A resolution of this trade-off may be agency assumption of liability on condition that use variances are issued and complied with or that user charges are based on metered water use with rapidly increasing rates above a predetermined limit.

## 3. IDENTIFYING SERVICES TO BE PROVIDED

TRD VI-A

The range of services that a management agency could perform in managing small waste flows systems varies greatly within the limitation of state guidelines. For Construction Grants grantees, Federal guidelines may also influence local discretion. Services chosen should be those needed to fulfill community obligations without superfluous regulation, authorities, manpower, or investments. Although a few services are essential to all management programs, many are optional, and their incorporation into a management program is left to community discretion.

Table III-C-1 lists administrative, technical and planning services that a community might select.

## 4. DETERMINING HOW SELECTED SERVICES WILL BE PERFORMED

It is an artificial distinction to separate selection of services from the definition of how they should be performed and the designation of parties and persons to perform them. In practice, these three design steps will be taken in sequence, and perhaps repeated, each step directly influencing the others.

EIS III-I

Taken by itself, this step defines specific practices by which the services will be provided. For instance, for water quality monitoring, the decision must be made whether to include non-point source and surface water monitoring. Then the groundwater monitoring plan, and other monitoring as decided, must be designed. This step would also develop the user charge system and make decisions on financing the local share. For plan review services, specific policies on experimental or innovative systems may be established or existing standards and procedures may be confirmed.

## 5. DETERMINING WHO WILL BE RESPONSIBLE FOR PROVIDING SERVICES

Generally there are three groups who could provide the services selected and detailed in the two prior steps:

TABLE III-C-1. POTENTIAL MANAGEMENT PROGRAM SERVICES

---

Administrative

- Staffing
- Financial
- Permits
- Bonding
- Certification programs
- Service contract supervision
- Accept for public management privately installed facilities
- Interagency coordination
- Training programs
- Public education
- Enforcement
- Property/access acquisition

Technical

- System design
- Plan review
- Soils investigations
- System installation
- Routine inspection and maintenance
- Septage collection and disposal
- Pilot studies
- Flow reduction program
- Water quality monitoring

Planning

- Land use planning
- Sewer and water planning

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- the public management agency (includes assistance from regional and state organizations),
- property owners or occupants, and
- private organizations such as contractors, consultants, development companies, private utilities, and private community associations.

TRD VI-C Some communities may control services by providing them directly, but others may provide those services that only the designated regulatory body can provide (as permit issuance and enforcement), supervising the services assigned to owners or private organizations. Assignment of service responsibilities should account for the skills and regulatory authority needed to successfully provide the service as well as the costs for different parties to provide them and the risks attendant on poor performance.

EIS IV-A-3 The public management agency need not be a new or single-purpose organization. Personnel with appropriate expertise may already be available in agencies with necessary authority to provide public management services. A combination of interagency agreements, supplemental training of existing personnel and new hires will be an adequate basis for agency development in many communities. Other communities may, for various administrative or legal reasons, find it more suitable to establish a new operating agency.

### 6. IMPLEMENTING THE MANAGEMENT PROGRAM

The last step in the design process is implementation of the management program. The specifics of this step will vary widely depending on decisions made in the design process. Examples of implementation procedures are:

- drafting and adopting county or municipal ordinances establishing the agency or providing it with needed authorities,
- EIS III-K hiring new personnel,
- notifying potential contractors and consultants of performance criteria and contract requirements for operating within the management district,
- drafting and adopting interagency agreements,
- EIS III-D creating a sanitary review board, and
- EIS IV-G informing property owners about their responsibilities for specific services.

## D. PUBLIC INVOLVEMENT IN AGENCY DESIGN AND OPERATION

Public attitudes toward community growth and public management of private wastewater facilities must be considered in agency design decisions.

EIS IV-D-2 The use of small waste flows systems in some settings will directly impact community growth. Unlike centralized systems, small waste flows systems do not provide impetus for growth. While this may be desirable in many rural areas, other areas seek the growth facilitated by centralized sewers for economic and other reasons.

EIS VI-B On the other hand, the use of alternative small waste flows systems facilities may permit the development of land formerly considered undevelopable. This may lead to scattered rural development and/or the development of enviromentally sensitive property, which may be contrary to public desires. Such development may be controlled by effective land use planning if the problem is recognized.

Community understanding of public management of private wastewater facilities will be limited in many rural areas. Where community management is desirable, the public must be educated about its benefits if the program is to be successful.

The public will be directly involved in agency design and operation when individual homeowners are affected by management agency policy and decisions. Homeowners may be required to perform necessary maintenance, to repair, replace, and upgrade failed systems and to pay user fees to the management agency. These requirements may meet with considerable opposition unless an effective public education program is initiated to inform homeowners about their role in the community management programs. Homeowners should be notified and kept informed of their responsibilities and obligations to the management agency.

EIS IV-G To involve the public more directly in agency design and operation, a Sanitary Review Board of community residents could be established. The board would ensure that the management agency's technical and economic decisions are consistent with citizen interests. The powers and duties of the board could be structured to reflect citizen interest. The board might maintain autonomous control over management agency decisions and personnel, or it could serve as an advisory body to the agency. Where the board is given autonomous authority, it may be desirable for the administrator of the management agency to be a member of the board to ensure that technical matters are properly understood and considered. The board could also act as an appeals body to hear and decide on objections to agency decisions. This function is similar to that performed by zoning and other boards.

## E. USE OF VARIANCES

TRD VII-A-B

Variances might be granted where practical or physical constraints prohibit literal compliance with the regulations. All states in Region V currently allow construction variances for the new construction of on-site systems where conditions prevent conformity to code. Variances may also be granted for existing systems.

In any small waste flows district with existing on-site systems, many systems may not conform to current regulatory standards for site conditions, system design, or distances from wells or surface waters. Some systems can be upgraded easily and inexpensively to conform with current codes. In many situations, however, upgrading may be unfeasible or impracticable because of site limitations and/or costs. From an economic viewpoint, it would clearly be desirable to continue to utilize a system for its full, useful life, as measured by absence of adverse public health or water quality impacts rather than by conformity to code.

Many study results have indicated the viability of existing on-site systems, including those which may not be in conformance with existing code requirements. Data developed during the study of alternative waste treatment systems for the Seven Rural Lake Projects indicated that many nonconforming systems operate satisfactorily and cause no adverse impacts. In these seven studies, although up to 90% of the systems were nonconforming, failure rates represented by system backups, surface ponding, elevated well nitrate levels and well coliform levels, combined, ranged from a low of 8% to a high of 27%. Many of the problems identified were the result of poor system maintenance and could be corrected with minimal cost and effort. Chemical analysis was also performed on effluent plumes entering the lakes from groundwater. This indicated that even when drainfields or dry wells were actually in groundwater, water quality standards were met at adjacent shorelines in nearly all cases. Bacteriological and nutrient levels at the shorelines were comparable to those found in the center of the lake. The studies indicated that the natural assimilative capacity of soil/groundwater/surface water systems is greater than had previously been expected, and that actual public health and water quality problems caused by on-site systems were not as extensive as nonconformity with sanitary codes might indicate.

TRD II-D

### 1. CONSTRUCTION VARIANCES

TRD XV-A

Region V states currently allow variances for new construction of on-site systems where either practical or physical constraints make literal compliance with the regulations infeasible. Presumably, such variances could also be granted where upgrading is necessary for existing systems. This type of variance may be considered as a construction variance since it allows construction which is nonconforming to the regulations.

Generally, existing nonconforming systems are considered "grandfathered" systems and they are permitted to operate until problems arise. Correction is then normally required to bring the systems into conformance, if possible. If not, construction variances may be required.

### 2. USAGE VARIANCES

In most cases, existing nonconforming systems are not inspected. The governing body may have little or no knowledge of system design or construction and takes no liability for the system's performance. Difficulties arise, however, when nonconforming systems are inspected during a sanitary survey. The governing body then becomes cognizant of the nonconforming systems, and their liability for system performance may change. For example, if the governing body allows continued use of nonconforming systems with no structural changes, a court may rule, upon subsequent system failure, that the governing body was negligent in not requiring these systems to be upgraded, since the government was cognizant of the systems' nonconformity. The inspection and the lack of required upgrading may be considered tantamount to permitting the systems.

EIS III-C-2 To prevent this type of liability problem, a second type of variance, termed a "usage variance," may be granted. Usage variances are granted to those systems considered to have additional useful life, and which are not now causing, and generally have a slight potential for causing, public health or water quality problems. By issuing a usage variance, the governing body is legally recognizing that a nonconforming system exists. At the same time, the governing body notifies the system owner of the system's nonconformity, of his or her liability in case of system failure, and of maintenance and flow reduction measures that may be required. This process results in a clear record between the governing body, system owner, and other interested parties concerning the continued use of the system and liability in case of system failure. Provided that the governing body has the power to grant such variances and that the justification for each variance has been documented, the governing body would be within its discretion in deciding to grant such variances, and not liable for legal action in the case of system failure.

## 3. ISSUING VARIANCES

Construction or usage variances may be conditional, requiring periodic monitoring of system performance and renewal of the variances based upon satisfactory system performance. Conditions could also limit building occupancy or require the use of flow reduction devices.

Decisions to grant variances should be made on a well-documented, case-by-case basis. Construction variances should be restricted to those situations where compliance with regulations is impracticable or unfeasible and where, based on data concerning similar systems, soil conditions, and other information, the proposed construction can be reasonably expected to perform adequately and cause no adverse impacts. Usage variances should be limited to situations where site-specific performance data can be obtained concerning existing system performance.

TRD VII-B The variances granted should directly relate to the financial resources and staff expertise available to the governing body. Where financial resources allow performance monitoring and employment of experienced personnel to minimize errors, the governing body may be more liberal in the types of variances allowed. Sufficient financial resources to correct future failures where variances have been granted for high risk sites would also be desirable. Where financial resources and experienced staff will be limited, more conservative variance guidelines may be considered. Although costs may be incurred when corrections must be made to systems previously granted variances, they are expected to be substantially less than the costs of making unnecessary system repairs for code conformance or of totally abandoning useful systems when no variances are allowed.

The use of variance procedures may alter a community's decisions in designing its management agency. When variances are utilized, the management agency accepts a higher risk of system failure in order to achieve a lower overall cost to the community by allowing continued use of existing systems. When it accepts this higher level of risk, the management agency may also elect to assume liability for system repairs. Assumption of liability, in turn, affects decisions on user charge systems.

## F. ACCESS CONSIDERATIONS

TRD VIII-A
40 CFR 35.2110

U.S. EPA Construction Grants regulations (U.S. EPA, 1982) implementing the 1981 amendments to the Clean Water Act require in Section 35.2110 that applicants for privately owned individual systems shall provide assurance of access to the systems at all reasonable times for such purposes as inspection, monitoring, building, operation, rehabilitation, and replacement. Access is also a consideration during facilities planning surveys and detailed site analysis.

When the individual systems are on private property, the community must obtain the legal authority to enter such property. The three ways that a community can legally gain access to private property for inspection of an individual wastewater system are:

1. by gaining the permission of the property owners,
2. by the acquisition of deeded rights, and
3. by a statutory grant of authority from the state legislature.

Each of these alternatives will be individually discussed.

### 1. BY OWNER'S PERMISSION

The easiest way to gain access to private property for purposes of inspection is with the owner's permission. This can be oral or written. There are several problems with this approach if a community requires guaranteed and long-term access. Bare permission by the owner can always be revoked. Moreover, when the property changes hands, the permission granted by the previous owner is of no legal standing. In some instances, the property owners may be difficult to locate, and a minority of property owners can be expected to refuse to grant permission under any circumstances. For these reasons, a community eventually may need more binding legal authority to enter property. Owner's permission will usually suffice for community surveys during facilities planning, however.

### 2. ACQUISITION OF DEEDED RIGHTS

The acquisition of deeded rights may involve the community in obtaining easements, easements in gross, or outright ownership of the individual wastewater systems. Easements confer a legal right, formally conveyed by deed or other witnessed and notarized writing and filed with land records, which conveys to one property owner the right to use the land of an adjacent property owner for a specified purpose. As applied to individual wastewater systems with no physical connection to agency-owned property, such a conventional easement may not be possible. The right to enter the property of another, unrelated to the ownership of adjoining land, is sometimes called an easement in gross. However, easements in gross are sometimes held to expire upon a change of land ownership.

Property law relating to easements is highly formal, technical, and specific to a given state. Communities needing to acquire easements should consult first with local property attorneys and state or county agencies.

### 3. STATUTORY GRANTS OF AUTHORITY

In general, there are three types of statutes that confer rights of entry on municipal officials in connection with wastewater treatment systems:

1. statutes to abate or prevent nuisances,
2. statutes requiring licenses or permits, and
3. statutes establishing special wastewater management districts for small waste flows systems.

Statutes that confer the right to enter and inspect private property are commonly based on the community's right to prevent and abate nuisances. Since individual wastewater systems are traditionally considered to be nuisances per se when so constructed or maintained as to threaten or injure the health of others, communities can regulate and take actions necessary to assure compliance with their requirements for the construction and maintenance of private wastewater systems.

Statutes requiring licenses or permits can be utilized to require owners to obtain renewable permits for the continued use of their wastewater system. With such requirements courts often imply, if they do not state expressly, that entry and inspection are necessary prerequisites for the renewal of the permits.

Statutes granting communities the right to form on-site wastewater management districts have also granted communities access rights once the management district is formed. To minimize problems arising with utilization of such blanket authority, the degree of intrusiveness of any inspection program should be minimized consistent with maintaining the effectiveness of the district. Public education should be part of any inspection program, and homeowners should be notified prior to inspection.

Under the U.S. EPA Facility Requirements Division Memorandum of July 8, 1980, access by statutory grants continued to be considered equivalent to public ownership or easement in satisfying requirements of 40 CFR 35.2110. Some state statutes granting this access limit it only to certain classes of municipalities.

## G. IMPLEMENTING WATER CONSERVATION PROGRAMS

TRD VIII-D

Rural unsewered areas may be supplied with water by individual wells or by a community distribution system. Homeowners supplied by public systems often use more water than those with individual systems. The chances for hydraulically overloading on-site wastewater systems is subsequently greater for those served by a public water system. Methods for implementing water conservation programs in these areas include:

- rate structure changes (increases in price),
- use restrictions,
- changes in plumbing codes,
- public education, and
- community subsidized distribution of flow reduction devices.

For rural areas served by individual wells, pricing schemes, use restrictions, and legal limits on amount of water used are not usually feasible. Water conservation programs for unsewered areas with individual water supplies must therefore rely on 1) changes in plumbing codes, 2) public education, 3) community subsidized water conservation devices, or 4) on-site system permits requiring the installation of flow reduction devices. Combinations of these methods should be considered when planning a water conservation program.

Plumbing codes can require that plumbing fixtures used for new construction and retrofit applications be of the low-flow type. This method would gradually result in most residences using water conservation devices. While gradual replacement will achieve 20-year design goals with centralized wastewater facilities, more rapid methods for implementing water conservation programs may be needed to achieve water quality and public health goals with small waste flows facilities.

Public education can focus on the following economic benefits of flow reduction:

- reduced well water pumping,
- reduced water treatment (where treatment is necessary),
- reduced energy costs for heating water, and
- prolonged life of on-site wastewater treatment system.

Public education should be used in conjunction with other methods of implementing water conservation programs to achieve the maximum benefit of each method.

Communities can subsidize the purchase and installation of flow reduction devices. This practice provides homeowners with a readily available means to conserve water and fosters good public relations at the same time. Distribution and installation of water reduction devices should be followed up to determine public acceptance and utility of the devices in saving water. Follow-up studies can determine the best devices for future distribution. Another method includes a requirement in the permit issued for on-site treatment systems stating that flow reduction devices will be installed. Such restrictions could be written into permits for new systems as well as those for upgrading or replacing failed systems.

## H. MONITORING GROUNDWATER AND SURFACE WATER

TRD VIII-C

The success of pollution control programs cannot be taken for granted. There are many causes of unsatisfactory performance for any facility. Generally, the more complex the program or the greater the number of facilities, the greater the probability of failure. Early, thorough consideration of the causes of failure may prevent many potential failures. However, failures may still occur. Depending on the value of impacted resources, long-term monitoring may be necessary to complement structural elements of a selected pollution control program. Groundwater and surface water monitoring approaches are discussed below as they would be applied in small waste flows management.

### 1. GROUNDWATER

Nearly all on-site and many small-scale wastewater technologies discharge effluents to the soil. Except in rare instances, the treated effluents then enter groundwater. Effluent impacts on receiving groundwaters and the resulting impairment of the groundwater's potential use are not easily predicted. Consequently, both facilities planning and long-term operational success depend on sample collection and laboratory analysis.

EIS II-D-2-b
IV-E-1

Groundwater sampling programs for facilities planning are discussed in Chapters II-D-2 and IV-E-1. Information developed for planning will help define the need for and methods of long-term groundwater monitoring.

Three types of groundwater monitoring strategies may be needed: potable well sampling, aquifer sampling, and shallow groundwater sampling.

### a. Potable Well Sampling

Most dwellings served by on-site systems in Region V also have on-site well water supplies. These wells are usually the point closest to on-site wastewater systems at which groundwater quality is a concern.

The following suggestions may be useful in developing local monitoring programs.

- On-site wells within 50 feet of drain fields, within 100 feet and down gradient from drain fields in unconfined aquifers, or penetrating unconfined fractured or channeled aquifers could be sampled annually.

- Sand point wells and other shallow wells down gradient from drain fields could be sampled every 2 to 5 years or when the on-site system is inspected every 3 years.

- Wells not at risk need not be monitored. Examples are properly located wells cased and grouted down to a known, continuous confining layer; wells known to be substantially upgradient from wastewater disposal systems; and wells that have tested satisfactorily over extended periods of time.

- Private wells serving more than one dwelling could be sampled as suggested for on-site wells except where water withdrawal may be sufficient to alter natural groundwater flow patterns. These could be sampled annually unless a hydrogeologist demonstrates why more or less frequent sampling is appropriate.

- Public water supplies should be sampled as required by state regulatory agencies.

At a minimum, sample analysis should include nitrate-nitrogen and fecal coliform bacteria. Where improperly protected wells (wells with inadequate seals, casing, or grouting) must be sampled, analysis is also recommended for non-naturally occurring constituents of domestic wastewater, such as brighteners or surfactants. This analysis will help determine the source of contamination.

When samples are positive for bacteria or show unexpectedly high nitrate concentrations, provisions should be made for confirmatory sampling within a short time.

### b. Aquifer Sampling

Sampling of aquifers will be necessary in addition to potable well sampling when large numbers of on-site systems are present in a groundwater shed or when wastewater from multiple dwellings or dwelling unit equivalents is land disposed at a single site.

Accumulations of nitrates in an aquifer down gradient from on-site systems are unlikely to affect public health unless a number of systems are lined up in the direction of groundwater flow. While the boundaries of groundwater sheds and flow vectors within them are difficult to delineate, it is safe to assume that single or double tiers of development will not result in hazardous accumulations of nitrates. Therefore, strip developments along roads or lakeshores should seldom be causes for aquifer monitoring. On-site well monitoring will suffice. For more intensive development, the need for and design of aquifer monitoring programs should be determined on a case-by-case basis by qualified hydrogeologists.

TRD II-K
III-B

Monitoring programs for cluster systems, rapid infiltration, or slow rate land application should be developed in concert with detailed design of of the system itself. Hydrogeologic studies conducted for site evaluation and system design will provide information required for development of the monitoring program. A minimum system size above which aquifer monitoring should be required is not recommended here. State regulatory agencies are encouraged to address this topic.

### c. Shallow Groundwater Sampling

On-site systems along stream banks and lake shores and larger land disposal systems located further away may contribute pathogenic organisms and phosphorus by effluent transport in groundwater. Although unacceptable discharges of this type should have been discovered and remedied during the Construction Grants process or similar work, continued surveillance of suspect systems may be advisable. The need for and design of a shallow groundwater monitoring program should be based on results of prior sampling, uses of the impacted surface waters, possible temporal changes in the discharges, results of septic leachate scans, and requests for this service from property owners.

## 2. SURFACE WATERS

Two types of surface water monitoring may be advisable in rural communities that rely on the optimum operation approach: effluent surveys and non-point source monitoring.

### a. Effluent Surveys

EIS II-D-1-c In lake communities, periodic septic leachate surveys would identify future groundwater failures of on-site systems and improve understanding of factors influencing effluent plume movement. As with septic leachate surveys conducted during facilities planning, a capability for collecting, storing, and analyzing selected samples is desirable.

Because the state of the art in leachate detection is still developing, and because of uncertainties regarding presently available instrumentation, shoreline septic leachate surveys will not be required at this time in monitoring programs. Purchase of currently available instrumentation will be eligible for Construction Grants funding until superior equipment is developed. Grantees will be required to show that comparable instruments are not available on a timely basis from other nearby grantees. Funded instruments will be made available to other grantees.

Where leachates from cluster systems, rapid infiltration systems, or slow rate land application systems are expected to emerge in streams or lakes, monitoring of the leachate may be required depending on proximity of the systems to surface waters, use of the surface waters, and results of aquifer monitoring. Appropriate monitoring methods should be specified during detailed design of the systems. The need to implement some monitoring programs may be conditional on results of aquifer monitoring.

### b. Non-point Source Monitoring

Grantees will not be required to monitor non-point sources of pollution. However, Construction Grants-funded laboratory facilities may be used for sample analysis. In comparing the cost-effectiveness of constructing a local laboratory with joint use of other municipal laboratories, or contracting with private laboratories, the projected number and type of samples can include those generated by a non-point source monitoring program that the grantee implements prior to or concurrent with Step 3 of Construction Grants activities.

### c. Nearshore Plant Surveys (New Section)

C.21. For portions of lakes for which off-site treatment facilities are funded to reduce nuisance nearshore plant growth, periodic surveys may be required to evaluate the effectiveness of the facilities and accompanying non-point source control measures.

Where on-site systems are retained along shorelines, plant surveys conducted with septic leachate detectors may help identify systems that are overloaded or that are not providing adequate treatment for other reasons.

## I. RECOVERY OF LOCAL COSTS

### 1. DEFINITIONS

TRD VIII-B

The local costs of a project will generally be allocated to users of the system. The local costs consist of private capital costs, public capital costs (local share of capital), interest on public debt, costs of operation and maintenance, administration and the reserve fund. With the exception of private costs, communities have a great deal of flexibility in determining how local costs are allocated and recovered.

Private capital costs will be borne directly by the users. That is, the users will contract for or purchase items related to the project. Examples of private cost items include house sewers, necessary plumbing modifications, and flow reduction devices. The payment of these costs is agreed upon by the user and contractor or supplier. Communities are not involved in the payment and recovery of private capital costs.

40 CFR 35.2030

The community is involved directly, however, in the recovery of public capital costs, interest on debt, operation and maintenance costs, and reserve fund costs. These costs are usually recovered through a user charge system. Construction Grant regulations, 40 CFR 35.2030, require that facilities plans present cost information on total capital costs, and annual operation, maintenance and replacement costs, as well as estimated annual or monthly costs to residential and industrial users.

Public capital costs need not be part of an approved user charge system. Instead, users may be required to pay capital costs at the beginning of the project. Other sources of funds might also be used such as general revenues. However, most communities do include capital costs and interest on public debt in their user charge systems. For centralized facilities and cluster systems, capital costs and interest can be recovered from both present and future owners. Public capital costs for on-site systems are recovered from present users only. Future users of on-site systems will not be subsidized, and all their capital costs will be private costs in the absence of a local government subsidy.

40 CFR 35.2140

Operation and maintenance costs, if the project receives grant funds, must be allocated on the basis of each user's proportionate use of the system. In the case of on-site technologies, some operation and maintenance costs may be paid by users directly to private contractors such as septic tank pumpers and haulers. Operation and maintenance costs which are incurred by a public agency, however, must be recovered from users. Construction Grant regulations specify two methods for recovering these costs: (1) actual use and (2) ad valorem taxes. It is doubtful that communities would already have ad valorem taxes for unsewered areas, so this choice is not available for use with optimum operation alternatives. With the actual use method, each user or user group pays its proportionate share of operation and maintenance.

EIS III-C

Proportionate share as implied by Construction Grant regulations (40 CFR 35.2140) is based on wastewater loading which would encompass flow and strength. However, most costs of operating on-site and small scale treatment facilities are related to services required (see Section III-C), therefore, to type of treatment facilities, site conditions and system age as well as wastewater loading. A user charge system which keys on allocating costs of services instead of wastewater characteristics, moreover, would better satisfy the stated goal of the regulations: "...that each user which discharges pollutants to the system that cause an increase in the cost of managing the effluent or sludge from the treatment works shall pay for such increased cost."

Administration costs for an optimum operation alternative with a strong public role can be a substantial part of on-going costs. Normally considered a type of operation cost, they are distinguished here because of their relative size and importance. Some costs of administrative services may be collected from contractors as license, certification, or inspection fees but would be paid ultimately by users.

A reserve fund is not required but is encouraged by U.S. EPA. The reserve fund can provide for replacement of equipment and future expansion of centralized facilities. For on-site systems, the reserve fund can replace systems that may fail in the future. The reserve fund reflects the liability a community is willing to assume for on-site systems. If the community assumes no liability for future failures of wastewater systems, a reserve fund is not necessary. Payments into the reserve fund generally are low when the failure rate for systems is low. Greater payments are required for a relatively high failure rate. Reserve fund charges can be levied from different user groups at varying rates.

## 2. COST RECOVERY OPTIONS (New Section)

Table III-I-1 presents the major options that communities may want to consider when allocating local costs of an optimum operation alternative. In selecting options, the topics discussed below might be considered.

TABLE III-I-1. COST RECOVERY OPTIONS

| | | Initial Assessments | | Continuing Payments | | |
|---|---|---|---|---|---|---|
| | Owner payment to contractors or suppliers | Average within user groups | Bill individual user | Average within user groups | Bill individual user | Contractor payment to management agency |
| Private Capital | x | | | | | |
| Public Capital | | x | x | x | x | |
| Interest on Debt | | | | x | x | |
| Administration | | | | x | x | x |
| Operation and maintenance | x | | | x | x | |
| Replacement | x | | | x | x | |

### a. Private vs. Public

To keep user charges and initial assessments to a minimum, such costs as capital for facilities not eligible for grant funding, charges for some operation and maintenance services, and expenses for replacing systems that fail in the future could remain the responsibility of property owners. While low user charges are attractive politically, they may result in false economies if owners neglect to purchase needed facilities and services.

### b. Initial Assessments vs. Continuing Payments

Another device used to keep user charges down is an initial assessment. Initial assessments reduce both the capital that has to be recovered and interest on debt. With sewered facilities, these assessments take the form of connection charges, front-footage fees or fees based on property value.

Similar assessments can be made with on-site and small-scale facilities. For many of these facilities, the entire local share may be very small after Federal and state grants so that collecting the local share as initial assessments might not be a financial burden for owners and could avoid long-term public indebtedness.

### c. Averaging Costs within User Groups vs. Billing Individual Users

With centralized collection and treatment systems, user groups are typically identified as residential, commercial, small industrial, large industrial, etc. These distinctions are valid also with on-site and small-scale systems but additional distinctions are also valid. Examples are type of facilities, age of facilities, and history of failures. Please note, however, that neither past nor present Construction Grant regulations consider allocation of O&M costs on any other basis than wastewater characteristics and ad valorem taxes.

The case for charging by user groups in conjunction with an optimum operation alternative is based on the concept of efficiency. That is, it can contribute to meeting the goals of a project at the least overall cost. In particular, billing by user group would be less expensive than assessing cost property-by-property. In the extreme case, an unsewered community may recognize only one user group such as "residences served by on-site systems" so that all public costs would be averaged to each residence. Another benefit of billing by user groups is that those owners who required periodic expensive maintenance or repair could see their costs averaged. The work would be more likely to get done in a timely manner.

The benefit of avoiding occasional, high expenses could be achieved with individual user billing if the management agency would amortize the expense over a period of time, in essence, create a loan program for expense over a predetermined amount. This would lessen the impact of an owner having to come up with the cash all at one time. The problem would, therefore, more likely be remedied quickly. Of course, billing costs would increase even more.

The individual user billing option is the most equitable method. That is, each owner pays for what he gets. Knowing that other owners are not going to subsidize his costs, an owner is encouraged to keep his costs down by using his system wisely. To the degree that owners behave this way, individual user billing is both equitable and efficient.

Nevertheless, individual user billing can be unnecessarily burdensome and very inefficient with owners who must use high cost systems such as holding tanks or water recycle systems. The annual costs of routine holding tank pumping can exceed even the highest sewer use charges. This penalizes, in a sense, the few owners with high cost systems who would have been better off if everyone had helped pay for a sewer. And the cost may induce them to dispose of sewage in a hazardous manner. In such cases, averaging some or all of these owners' costs over all user groups may be justified.

## J. BROADER RESPONSIBILITIES OF PUBLIC AGENCIES RELATED TO RURAL WASTEWATER MANAGEMENT

Public agencies managing small waste flows systems may already possess or may assume responsibilities in addition to those related to wastewater management. Assumption of multiple responsibilities may be particularly attractive in small communities with few paid personnel. In such communities, the small waste flows systems alone may not justify full-time positions, making multiple responsibilities more efficient. Examples of broader responsibilities that may be assumed by a wastewater management agency are discussed below.

EIS III-C-1-5
TRD VI-A
XI-A
EIS IV-D-2

Many rural communities lack any form of land use planning, the only land use restrictions relating to the suitability of a given site for on-site wastewater disposal. These restrictions may be altered through approval of innovative on-site systems or adoption of performance-based design standards by a management agency. If this occurs, the community may desire to develop appropriate land use designations. The management agency could be designed to provide this service.

EIS III-H-1

The use of private water systems is predominant in rural communities. In addition to ensuring adequate wastewater disposal, the management agency could ensure safe and adequate water supply. The agency can accomplish this by routinely inspecting and monitoring individual wells and/or community water supplies and by providing public education related to water supply management.

TRD X-D
EIS IV-A-3
TRD XI-C

Section 201(f) of the Clean Water Act of 1977 states that the administrator shall encourage waste treatment management that combines open space and recreational considerations with such management. A community management agency could coordinate the use of wastewater management district properties for recreational use, such as the use of a community drainfield for picnic or park land. The management agency could also manage recreational facilities not part of the management district.

TRD II-C
XII-G
EIS III-H-2-b

In communities with particularly sensitive water resources, the management agency could investigate and monitor sources of pollution unrelated to the wastewater facilities. In many rural areas, the management agency may be the only public body involved in pollution control; therefore, assumption of broader responsibilities in this area could be of great community benefit.

## K. PERSONNEL

TRD VI-D

A broad range of skills and expertise may be required by the management agency. Typical job titles that may be involved in some aspect of wastewater management include:

- system designer,
- clerk,
- administrator,
- inspector,
- attorney,
- equipment operator,
- plumber,
- small waste flows contractor,
- laboratory technician,
- water resource scientist,
- soil scientist,
- laborer,
- environmental planner, and
- wastewater system operator.

Although the list of job classification is long, one person could provide a number of skills. It is not necessary to employ one person to fill each position. Customary job titles such as engineer and sanitarian are not listed as such, in order to define more clearly the types of personnel needed and to avoid limiting personnel to these disciplines. Sanitarians and engineers could, however, fill many of the job classifications.

The task of defining and fulfilling management agency personnel needs required five steps:

1. assess skills and skill levels rewquired by the management agency,
2. estimate the level of effort required by skill,
3. inventory available personnel and define their sill levels,

4. select personnel to meet management agency needs and acquire their services through interagency agreements, hiring, or contracts, and

TRD VI-F 5. seek training programs to fill any remaining gaps in expertise required by the management agency.

A community planning a management program should consider hiring key personnel early in the process. These personnel, such as an administrator experienced with small waste flows technologies, would be invaluable in assisting the community in the design process, then later administering operation, maintenance and repair services.

TRD XV-C

EIS V-B-2

The search for personnel who may assist the management agency should not be limited to the local area. All sources of potential assistance should be evaluated, including state, regional and other municipal personnel, U.S. Soil Conserveice Service personnel, utility company workers, private contractors, and consultants. State and regional agencies can provide many types of assistance, including:

- direct technical assistance,
- assistance to local communities in grant application and administration,
- preparation of community wastewater needs analysis,
- identifying the local feasibility of small waste flows technology and management,
- review and upgrading of local and state regulations,
- dissemination of information on small waste flows technology and management, and
- preparation of manpower inventories for local small waste flows programs.

In many rural communities, economies of scale in management may be realized by sharing personnel with other communities, or by a regional agency furnishing assistance on a shared time basis.

The community management agency should ensure that private contractors and consultants hired to perform management agency services are experienced in the utilization and management of small waste flows systems. Without experienced assistance, the community may not fully realize the benefits of the optimum operation approach.

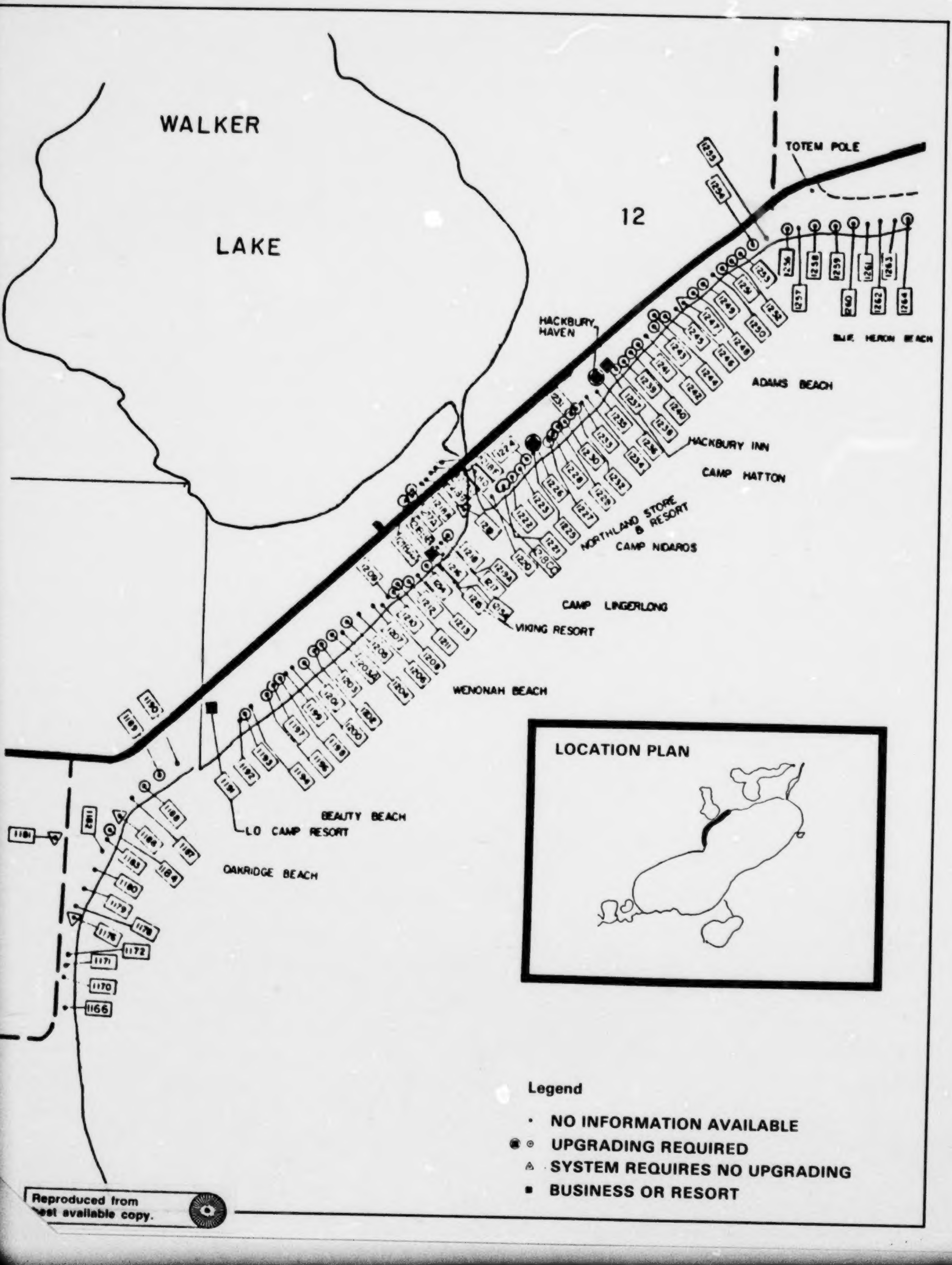
## L. REVISING THE MANAGEMENT PROGRAM

After the management program has been implemented, documentation of the performance of the program as a whole and of each of its component parts is important to long-term success and economy. Periodic review of this information, and evaluation and revision of the management program, should be an ongoing process.

The intitial implementation of a management program in a community cannot be expected to result in an ideal program. This is particularly true since community management of small waste flows systems as broadly defined in this EIS will be a totally new management approach for many communities. As the program is implemented, unforeseen problems with the system are likely to develop. Certain seemingly prudent management practices may appear otherwise in actual operation.

The agency should encourage feedback on its management program by soliciting and being receptive to community and public comments on the program. The agency should develop minimum requirements for periodic evaluation of the successes and problems in the management program and of necessary revisions to the program to make it operate more effectively.

Provisions for revision of the management program should be flexible enough to allow constructive improvement in the program without altering the community's original commitment ot the management of the small waste flows systems. Where this commitment is questioned, the community's original analysis of the need for a management program may have been wrong. If Construction Grants funds have been received for the individual systems, continuity in the management program must be assured by the community or by state or regional agencies.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CAMP LINGERLONG
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# CHAPTER IV

# FACILITIES PLANNING TECHNIQUES

Chapter II, sections D through F, discusses some of the most important aspects of facilities planning: needs documentation and alternatives development. This chapter discusses additional planning methods of importance to rural wastewater facilities planning.

Definition of planning area, assessment of water quality impacts, and calculation of current and future population and land use impacts, are sometimes technically difficult and even controversial subjects. If properly explored, however, they allow realistic assessment of project value and whether it will do more harm than good. Such information is of great value to the project whatever the Federal or State role may be. Indeed it may be of greatest value for the community that must plan and implement a wastewater system using only its own resources.

## A. PLANNING AREA DEFINITION

### 1. APPROACHES FOR DEFINING PLANNING AREA BOUNDARIES

TRD IX-B
CG 82-5.0

The wastewater treatment needs and facilities planning area for your community were identified during the water quality management planning process based in part on effluent limitations in your NPDES permit, applicable groundwater criteria and State requirements. You should review this information to ensure that the planning area is large enough to take advantage of economies of scale and efficiencies possible in regional planning, or decentralized or individual systems. The planning area will also be sufficient to ensure that the most cost-effective means of achieving the established water quality goals can be implemented, and that an adequate evaluation of environmental effects can be made.

When states and applicants decided on facilities planning area boundaries, several factors might have been considered:

- local growth and development objectives,
- geographic, geologic and hydrogeologic conditions

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Legend for Cross-References in Margins

| | |
|---|---|
| EIS I-C-2 | Section of this EIS |
| TRD II-A | Section of the Technical Reference Document published separately |
| CWA 201(g)(1) | Section of the Clean Water Act which necessitates change in the text |
| 40 CFR 35.2110 | Section of the Construction Grants regulations which necessitates change in the text |
| CG 82-6.2. | Section of the program guidance document, Construction Grants - 1982, upon which change was based. |
| C.26. | Comment on the Draft EIS relevant to topic discussed (see Chapter VII) |

All significant changes from the Draft except new sections are identified by underlining.

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- wastewater treatment needs,
- housing density and identified public health problems,
- sensitivity of local water resources to on-site system failure,
- availability of data (both socioeconomic and natural environment), and
- cooperation of local municipalities, and other political constraints.

Three basic approaches can be taken to delineate planning areas:

1. the jurisdictional approach,
2. the environmental approach, and
3. the development approach.

Each of these approaches has advantages and disadvantages for facilities planning in unsewered areas.

The jurisdictional approach delineates facilities planning areas based on county boundaries, municipal boundaries, or census count boundaries (census tract or minor civil division). This approach maximizes the applicability of published population and economic data, including census data, population (existing and projected), income characteristics, employment patterns, and land use plans. This approach may also have possible management advantages in that existing governmental structures can handle implementation of the facilities plan proposed action and can facilitate the formation of a small waste flows management district to maintain facilities. Additionally, finance mechanisms may be easier to implement at this level.

This approach has drawbacks, however. It could lead to conflicts between jurisdictions resulting from lack of cooperation, which in turn could limit the range of alternatives that could be implemented. Environmental impact evaluation may not be comprehensive at this level. This approach may exclude small outlying problem areas and could preclude evaluation of cost-effective alternatives.

Based on previous work for the Seven Rural Lake EIS's, the jurisdictional approach will be difficult to utilize in some large lake areas in U.S. EPA Region V because these areas generally traverse several municipal boundaries.

The environmental approach considers the watershed or lake drainage basin as the principal unit of delineation for facilities planning. Point and non-point sources of pollution can be comprehensively addressed at this level. This unit of evaluation takes into account the sensitivity of water resources to septic tank failures. Data for natural resources may be more readily available at this level. Disadvantages of the approach may include the problem of municipal boundary crossover. In addition, the approach may not adequately consider local growth objectives. Applicability of published demographic data may also be difficult.

The development approach to study area delineation would utilize both the existing development areas, which are designated for future residential, commercial, and industrial growth, and the undeveloped waterfront areas to establish planning area boundaries. These development areas would include growth areas defined in local municipal comprehensive land use plans and zoning ordinances. This approach would include all areas that are expected to increase in population during the planning period. Formally adopted growth objectives would thus be adequately addressed in this approach. However, several problems may arise with this approach, including difficulty in applying socioeconomic and environmental data. This approach may not adequately address the major sources of water quality problems or septic tank failures.

## 2. IDENTIFICATION OF PLANNING AREAS WHERE OPTIMUM OPERATION ALTERNATIVES SHOULD BE CONSIDERED

The optimum operation approach fills a niche between sewering and doing nothing. The niche can be described in terms of development density, number of on-site system failures, sensitivity of water resources, feasibility of abating failures on-site and cost-effectiveness. Table IV-A-1 relates these factors to the limits of the optimum operation niche in a general way.

EIS II-F-2

In the very early stages of facilities planning, that is, in defining facility planning area boundaries and preparing Plans of Study, conclusive information regarding these factors may not be available. However, preliminary information can be gathered from an inspection of topographic maps or aerial photographs (development density), interviews with local health officials or natural resource personnel (number of on-site system failures, sensitivity of water resources, and feasibility of abating failures on-site), and use of cost curves (cost-effectiveness).

TABLE IV-A-1. FACTORS THAT DETERMINE LIMITS OF THE SMALL WASTE FLOWS NICHE

| | Development Density | Number of On-site System Failures | Sensitivity of Water Resources | Feasibility of Abating Failures On-Site | Cost-Effectiveness |
|---|---|---|---|---|---|
| Do Nothing vs. Small Water Flows | x<br>These three factors together determine a community's obligation to improve wastewater management in unsewered areas. | x | x | | |
| Small Waste Flows vs. Sewering | x<br>Primary determinants of cost-effectiveness comparisons. | x | | x<br>May preclude successful use of the optimum operation alternative in parts or all of a community. | x<br>Will incorporate many unlisted factors such as environmental constraints to sewer construction, mix of on-site and small scale systems required, local management options, growth rate. |

If delineation of facilities planning area boundaries or decisions to consider optimum operation alternatives have to be based on housing density alone, it is recommended that any unsewered areas developed at 10 to 125 houses (or dwelling unit equivalents) per mile of road be designated as potential parts of a small waste flows district. Below 10 houses per mile, water quality and public health problems caused by on-site failures will rarely be cause for public concern (although facilities planners should look for exceptions during needs documentation work). Above 125 houses/mile, sewering to either small-scale or centralized off-site facilities will become increasingly cost-effective for solving water quality or public health problems.

## 3. ADVANCE PLANNING TO SAVE TIME AND EFFORT

A number of advance steps may be taken to circumvent significant conflicts and provide creative input to the facilities planning process. These steps consider non-water quality goals that nevertheless have considerable influence over the facilities planning process. These include critical aspects such as initiation of public participation efforts, planning of recreational resource development, and definition of community development goals and objectives. Municipal officials have often complained of the length of time required to complete the facilities planning process. If local interests were to devote energies to the resolution of these issues prior to planning, considerable time would likely be saved in the facilities planning process. Advance planning would permit a locality to deal with non-water quality issues in a way that would help avoid controversy, minimize the impacts of proposed facilities, and maximize the potential benefits of the planning process.

TRD XIV-A

Almost every one of the Seven Rural Lake EIS's was prepared in the midst of significant public controversy about the facilities plan. Because of the complexity of the facilities planning process, early contact with the citizens of the area is a necessity. For any given alternative, some segments of the population will feel harmed and others helped. Those that perceive themselves harmed may form coalitions and even bring litigation based on only a partial understanding of a project. A public information/education program would respond early to concerns raised by the public and would explain what facilities planning is, how it proceeds, how wastewater projects affect the community, and how the public can provide input.

TRD X-D

The facilities planning process offers opportunities to analyze the need for recreation resources in an area and to maximize recreation potential. Section 201 (g)(6) of the Clean Water Act, requires applicants to evaluate the recreation and open space opportunities achievable with their proposed facilities as part of overall planning for wastewater treatment facilities in. A preliminary study area evaluation of existing facilities and activities can be accomplished at little expense with assistance from local homeowner associations, 4-H clubs, senior citizens groups, or others. In the case of the optimum operation alternative, certain forms of treatment, especially cluster systems, may offer some recreational potential.

EIS IV-D
VI-D

TRD XI-A&B

New forms of wastewater treatment that overcome unfavorable site conditions may induce residential development in patterns and densities unanticipated at the local level. To mitigate these impacts, land use planning and the adoption of growth management controls should be considered before beginning facilities planning. In areas without adopted plans and ordinances, this type of effort would establish community development goals and objectives relating to residential, recreational, commercial, and industrial development. Formally adopted land use plans most often take into account the character of a community and its natural resource base, and establish both conservation and development priorities. Such a program backed by an updated zoning ordinance with environmental performance standards will provide facilities planners with specific guidance on the

EIS III-D likely amount and spatial distribution of growth for which wastewater treatment must be provided. A comprehensive plan would also have undergone public scrutiny and taken into account points of public controversy that would otherwise hinder the facilities planning process. An adopted comprehensive land use plan would thus significantly expedite facilities planning.

Facilities plan applications are sometimes made by local public work departments with little coordination with other functional departments. Advance planning functions may be carried out by county or municipal planning departments, local recreation agencies, and local public health officials. Frequently, regional planning commissions or councils of government have both experience and technical expertise that can be utilized in a particular study area. These organizations may have conducted 208 plans for the area and may have public participation mailing lists and data on land use and population, as well as on sensitive environmental areas. Thorough coordination and advance planning by these agencies could greatly expedite the planning process and prevent significant controversy.

## B. DEMOGRAPHY

CG 82-5.5.1 Accurate demographic information and projections play an important role in determining project need, designing workable alternatives, and assessing project impact. Section 5.5.1, "Population and Land Use Projections" in Construction Grants - 1982 repeats relevant requirements and offers guidance on projecting future populations. Accurate information is just as important for the community that must plan and build its facilities alone.

### 1. RECREATIONAL DEMAND IN LAKESHORE AREAS

TRD X-C

Recreation lot sales and second-home development have been a significant market force in the United States in recent years. Rising levels of disposable income, ready mobility, and increased leisure time have led to an increase in the purchase of second homes. This has been true particularly in areas near inland lakes and rivers and areas accessible to major employment centers (Marans and Wellman, 1977).

However, the future of second-home development is uncertain. The housing recession and oil shortage between 1973 and 1975 resulted in a significant downturn in second-home development (American Society of Planning Officials, 1976). If this experience is extrapolated to current conditions, the availability of gasoline for leisure travel and prevailing interest rates may curtail this type of development.

TRD X-B The late 1960s through the mid-1970s, however, showed a steady climb in this type of development. Data from the Seven Rural Lake EIS project areas showed an increase in dwelling units between 1970 and 1975 of 12.4% on Crooked/Pickerel Lakes, 12.5% on Otter Tail Lake, and 15% on Crystal Lake. Table IV-B-1 shows the increase in total population projected for each of the Seven Rural Lake EIS communities to the year 2000 and the percentage of the increase accounted for by seasonal (second-home) residents. Population growth ranges run from a low of 1.6% at Nettle Lake, Ohio, to a high of 33.5% at Crooked/Pickerel Lakes, Michigan. As these data show, rural lake areas are projected to experience fairly rapid rates of growth, comprised to a large extent of seasonal residents.

The overwhelming attraction for second-home development is accessibility to lakes and rivers and the recreation opportunities that they afford (Marans and Wellman, 1977). In Michigan, 55% of second homes are on inland lakes, 21% on the Great Lakes, and 10% on rivers or streams; of the total, 89% are within a 5-minute walk of some body of water (ASPO, 1976).

TABLE IV-B-1. SEVEN RURAL LAKE EIS POPULATION PROJECTIONS (INCREASE TO THE YEAR 2000 AND SEASONAL POPULATION EXPRESSED AS PERCENTAGES)

| Study area | Population (% increase) | Seasonal (% of increase) |
|---|---|---|
| Crooked/Pickerel Lakes, Michigan | 33.5 | 47.7 |
| Crystal Lake, Michigan | 31.8 | 46.0 |
| Otter Tail Lake, Minnesota | 16.0 | 76.0 |
| Nettle Lake, Ohio | 1.6 | 88.0 |
| Steuben Lakes, Indiana | 27.0 | 68.0 |
| Green Lake, Minnesota | 18.0 | 43.0 |
| Salem Utility District, Wisconsin | 31.5 | 27.6 |

Travel distance is a significant factor in the location of second homes. Data from a study conducted in northern Michigan indicate that the distance traveled to recreation homes averaged 250 miles (Marans and Wellman, 1977). Other studies state that accessibility is the key factor in second-home development, with natural amenities second (ASPO, 1976). This latter study indicates that most second homes in the United States are within 100 miles of the primary home.

However, lakefront access for recreation is deemed a critical factor by recreation home residents. The settlement pattern in five of the Seven Rural Lake EIS study areas was single-tier development along the banks of the major surface water bodies with direct access to those resources. In these study areas, public access in the form of public beaches or boat ramps is limited. Nettle Lake has no public facilities. On Crooked/ Pickerel Lakes only 2% of the shoreline is available, on Green Lake 2.9%, and in the Salem Utility District only 960 feet are in public access facilities. These limitations could severely curtail the incidence of second-tier residential development where little or no direct access to lakefront recreation is available.

Ragatz (1980) has projected demand for recreation properties in the north-central region of the United States to the year 1985. He cautions that these projections are based upon scant data and market statistics that have varied significantly in recent years. Table IV-B-2 shows these projections for recreation lots, single- family recreation homes, and resort condominiums. The number of households owning recreational properties is expected to increase by 21%, the number of households owning single-family vacation homes will increase by 14.2%, and the number of households owing resort condominums will increase by 32%.

Based upon data from the 1973 to 1975 housing recession, the rate of development in this market is influenced by major shifts in the economy. Sources agree that the future of the market will depend on the price and availability of gasoline as well as the availability of mortgage money and the prevailing interest rates. Possible shifts in the market could occur that would encourage more intensive lakeside development in areas closer to major employment centers.

## 2. PROBLEMS IN ESTIMATING PERMANENT AND SEASONAL POPULATIONS OF SMALL SERVICE AREAS

TRD X-B

The estimation of population levels within a proposed wastewater management service area is important in the design of a wastewater treatment system and in the evaluation of impacts induced by a proposed system. Relevant

TABLE IV-B-2. RECREATION DEMAND IN THE NORTH-CENTRAL REGION OF THE UNITED STATES

| | 1980 | 1985 |
|---|---|---|
| Total number of households | 20,500,000 | 22,000,000 |
| Number of households owning recreational properties | 1,827,200 | 2,318,400 |
| Number of households owning single family vacation homes | 1,107,600 | 1,290,200 |
| Number of households owning resort condominiums | 163,200 | 240,000 |

data are frequently available for permanent population; however, the application of these data to small rural service areas may prove difficult. The data may be outdated; they most often contain no information on seasonal population; analytical methods to derive the data are often based on assumptions unsuitable for wastewater treatment planning and design; or the data base is unacceptable for use at the small area level. Frequently, the required data are not even available for small rural service areas where no formal planning exists. In addition, many factors that influence rural area population dynamics, such as current dwelling unit permits, housing occupancy rates, or dwelling unit conversions, are largely undocumented.

A recurring problem in rural areas that include some type of natural recreational resource (that is, lakes, mountains, rivers) is the determination of permanent versus seasonal population. In many of the rural service areas where such resources exist, seasonal residents (normally summer) comprise a major portion of the total population. Even though the annual volume of wastewater that seasonal residents generate is less than for permanent residents, the treatment level and peak flow capacity of central treatment plants are not reduced. Consequently, the determination of a permanent versus seasonal population breakdown is an important consideration for calculating design flows for conventional treatment systems.

The U.S. Department of Commerce, Bureau of the Census, is the major source of demographic data. However, census data have several limitations that restrict their use for small rural planning areas. Since the census is taken at 10-year intervals, the data quickly become outdated. The data are usually reported on the township level, and townships are generally considerably larger than facilities planning boundaries. More important, though, is the total lack of information differentiating seasonal versus permanent population data.

The amount and type of population information available from the state agencies vary. Population estimates at the county and sometimes township level are prepared annually in conjunction with the Census Bureau. Again, these types of information apply to larger areas than are associated with many rural facilities planning areas.

Regional planning or 208 water quality agencies will have population data for facilities planning areas. There are a number of drawbacks to using these data. Figures from Federal or statewide projections are often not sensitive to population dynamics on the local level. In practice, population projections assigned to facilities planning areas are seldom compiled for areas smaller than the township level. They may not, therefore, contain information relevant to small facilities planning areas; and they reflect scant data on seasonal population. Also, these data often do not differentiate between the population to be served by planned facilities and the total population of the facilities planning area. Oversized facilities can be the result.

Municipal and county planning departments or other local government offices may be able to provide pertinent data concerning rural area populations. Tax rolls, utility connections, special school censuses, and building permits can be used to determine the current number of dwelling units, permanent and seasonal composition, recent growth trends, and other characteristics of a given area. Such data are usually not published, and personal examination of office records is required to gather information specific to a facilities planning area.

State and private universities represent valuable sources for local demographic information. Universities with programs in urban and regional planning, urban studies, geography, or similar programs frequently conduct field studies that involve small towns and rural areas. These studies may contain useful data on the size and characteristics of local population, but may be difficult to obtain because they are often not published. Contacts with appropriate university personnel are usually required to determine if such studies have been performed and are available.

EIS II-D-1-a Windshield surveys and aerial photo interpretation provide reliable and readily available methods for determining the number of housing units in a rural planning area. Housing unit data and local occupancy rates can provide the basis for current population estimates. In some rural areas, the windshield survey method may prove inaccurate because not all housing units are visible from public roads. These surveys should be used in conjunction with aerial photos for greater accuracy. It is also difficult to differentiate seasonal from permanent residences without some primary evidence such as a snow-plowed drive. Further, these surveys do not provide information on vacancy rates or average household size.

EIS II-D-3 There is no straightforward or easy method to determine the percentage of the population that is seasonal. For estimates of the existing population, house-by-house surveys provide the most reliable figures but are also expensive and time-consuming to obtain. However, if house-to-house survey methods are needed for other purposes anyway (such as sanitary surveys), then the incremental cost for population and occupancy data would be negligible. Local post offices and utilities can indicate which dwelling units are receiving mail or using various utility services on a year-round basis. The use of this information eliminates the need for house-to-house surveys except for some possible follow-up cross-check surveys.

The method most commonly used in the Seven Rural Lake EIS's was an analysis of the property tax rolls. The property tax rolls indicate the home address of the owner of each residence, identifying those dwelling units that are owner-occupied. While it cannot be fully determined which units are seasonally occupied and which are rented to permanent residents, a fairly accurate delineation of permanent versus seasonal units can be made. Discussions with local realtors may further refine this delineation. Application of permanent and seasonal household size figures to this dwelling unit delineation will then define the permanent versus seasonal population breakdown.

## 3. POPULATION PROJECTION METHODOLOGIES FOR SMALL SERVICE AREAS

TRD X-B Population projection techniques normally rely on one or more of six different types of models:

1. mathematical,
2. economic-employment,
3. cohort analysis,
4. component,
5. ratio/share, and
6. land use.

TRD X-B

Beyond these projection models, various disaggregation techniques may also be used to distribute the population totals to smaller subareas within a study area. These various projection and disaggregation techniques each have certain limitations, and some techniques are more applicable to smaller areas. Often, a combination of techniques is required to develop projections for a particular area. Models such as economic-employment, cohort analysis, or component methods are seldom feasible in rural areas because they rely on data from areas much larger than these facilities planning areas.

Mathematical projection models assume that the components that characterized past population change will continue for some period into the future. This extrapolation of historical trends requires relatively little data and consequently is simple to apply. However, such projections do not explain the reasons for past growth nor do they account for possible future changes that may affect future growth. In addition, they are normally more accurate for larger areas since the changes from past trends are more likely to average out over a larger area. As a result, these types of projections should only be used for short-term projections.

The ratio/share models use population projections available for a larger area and allocate a portion of the change to the area under evaluation. This type of projection assumes that the population change in a particular area depends on the amount of change in the larger region. The ratio of regional growth to local growth may be chosen from one point in time or as an annual average ratio from several periods.

EIS IV-D-1

TRD XI-B

Land use models project population on the basis of available land and expected population density. This type of projection reverses the process of projecting population growth first and then determining what land area will be required. Instead, it begins with the amount of developable land available and then determines how many people can be accommodated at full capacity. In order to determine the amount of developable land, an environmental constraint evaluation may be performed that incorporates information on land use, environmental resources, and economic factors. This evaluation defines the amount of developable land under existing land use laws and regulations and determines the number and distribution of potential dwelling units and population equivalents. Facilities planning, need area, and service area boundaries must be carefully delineated so that only land being served is analyzed for total population to receive wastewater treatment service.

The population projection methods discussed previously are applicable to small rural planning areas in varying degrees. Data requirements, assumptions, and the projection outputs may limit the usefulness of many of these projection techniques for small rural planning areas. During the preparation of the Seven Rural Lake EIS's, several different or a combination of projection techniques were utilized. Most of these projection methods relied at least in part on land use models and land holding capacity analysis. This combination seems to fit the requirements of small rural planning areas, given the data normally available for such areas. Only rarely will data be available to use more sophisticated projection techniques that result in somewhat more reliable projections.

## 4. ESTIMATING ECONOMIC CHARACTERISTICS OF RESIDENTS

EIS VI-C-3

The decennial census is the most comprehensive available source of information for population characteristics. The Census of Population is currently conducted at the beginning of each decade and serves as the basis for a series of related topics. Data typically presented at the state, Standard Metropolitan Statistical Area, city, county, and township levels include permanent population characteristics, income levels, employment patterns, and information on commercial and industrial trade. The data on household size, population levels, and vacancy rates are particularly important in wastewater management planning for small, rural areas.

More current information on population and per capita income is found in the Current Population Reports, Series P-25, Population Estimates and Projections, which is issued annually. The estimates are dated two years preceding the report date and include estimates of per capita income dated four years preceding the report date. These data do not describe characteristics of the seasonal population and are detailed only to the township or county level.

Economic data are available from the economic censuses published by the Census Bureau every five years. This census series is comprised of individual reports on retail trade, wholesale trade, selected service industries, manufacturers, agriculture, transportation, and mineral industries. Each report includes information on employment levels, wages, sales, size of firms, number of firms, and a level of production. The results are released in the form of printed reports and computer tapes. Their use in small rural areas is limited by the size of the reporting areas, which often include only county, state, and major incorporated areas.

State government agencies and departments can often provide other data such as income levels, retail sales, employment data, and local government finances. The availability and source of these data vary from state to state. However, when such data are available, they may often be more current and relevant to small rural areas than Census Bureau data.

Regional planning and development agencies are often responsible for preparing demographic studies, comprehensive plans, economic studies, and community facility reports for the small villages and rural settlements within their jurisdiction. Information obtained in these types of reports can be useful in establishing baseline economic conditions as well as economic projections. Many regional planning agencies and councils of government are also designated as economic development coordinators for the regions requiring that an Overall Economic Development Plan (OEDP) be submitted annually to the U.S. Economic Development Administration (EDA). This plan normally includes information on demography, economic base, income levels, and public works projects.

Municipal and county planning departments or other local government offices may be able to provide economic data on rural area populations. Often township or county comprehensive land use plans will contain information on local per capita income, unemployment rates, and commercial and industrial statistics. Considerable information is usually available on housing construction, vacancy rates, and property values. Local property tax roles, already mentioned as a source of population data, may be useful as an assessment of relative housing values.

Housing values taken from property tax roles may be the only economic data obtainable for seasonal residents. If economic impacts of wastewater alternatives on seasonal residents will be decisive for alternative selection, a special economic survey may be necessary. Data requested could either be household income or a maximum amount the respondent is willing to pay. Data can be collected by mailed questionnaire or door-to-door survey, possibly in conjunction with needs documentation surveys.

Other sources of information are local real estate agents, homeowner associations, chambers of commerce, utilities, and other community groups. Discussions with local real estate agents can yield information about housing vacancy rates, housing stock, property values, and second-home construction. Real estate agents may also be aware of planned developments and future market activity in the area. Local homeowner/ community groups, on the other hand, may be able to provide information regarding housing vacancy rates and shifts from seasonal to permanent occupancy.

## C. CATEGORICAL EXCLUSIONS FROM ENVIRONMENTAL REVIEW (New Section)

In March 1982, U.S. EPA published procedures for granting categorical exclusions from detailed environmental review requirements for certain Construction Grants projects (47 FR 9827-9831). Categorical exclusions are intended to apply to actions that are small scale, minor, and routine. Generally, environmental information documents and environmental assessments or environmental impacts statements will not be required for excluded actions.

Communities proposing to construct small on-site facilities are eligible for categorical exclusions. Actions that directly or indirectly involve the extension of new collection systems or that create new discharges to surface or groundwaters will not be eligible for an exclusion.

The time and money saved by exclusions will depend on how early in the planning process that a community decides to upgrade existing wastewater facilities. State and Federal review officials are expected to determine as early as possible whether a project is eligible for an exclusion. But to make this determination, he or she must receive a brief description of the proposed action. In complex situations, where the choice between new centralized facilities and continued use of existing facilities requires significant environmental analysis anyway, the actual savings in time and money may be small. However, for a great many small communities, continued use of existing facilities with necessary upgrading and improved management will be the clear early choice. These communities can then devote a larger portion of available funds to finding, analyzing, and solving wastewater problems.

The availability of categorical exclusions should not become an excuse for avoiding all environmental analysis. As discussed in the next two sections and throughout Chapter VI, the continued use of on-site systems can have adverse effects on the human and natural environment in some settings. Communities are urged to remain attentive to the possibility of such effects and to assess them in a timely manner. Otherwise the categorical exclusion may be revoked and the full environmental review process reinstituted.

## D. LAND USE AND ENVIRONMENTAL CONSTRAINTS

### 1. NONSEWER DEVELOPMENT CONSTRAINTS

TRD XI-A

One of the major findings of the Seven Rural Lake EIS's was that significant differences in population growth, land use conversion, and environmental impact would result from sewering versus not sewering the rural lake communities. The decision of whether or not to sewer has significant implications for a community's future. However, many rural communities rely on limited planning tools that fail to recognize important environmental and economic resources. They rely heavily on general soil limitations for on-site systems to justify low density land use zones. This has served to limit the amount of vacant developable land in these areas. It is, therefore, in the best interests of rural communities to examine land use potentials carefully as a critical element of their decision-making for wastewater treatment facilities. This is particularly true for rural lake communities because of the high incidence of environmentally sensitive resources.

TRD XI-B

An environmental constraints methodology uses information on land use, environmental resources, and economic factors in the design and evaluation of wastewater management alternatives. The process involves an inventory and mapping of natural and man-made factors in the study area, followed by interpretation of the degree of constraint on future development caused by these factors. This will allow compilation of data into a form permitting facilities planners to view areas where no residential development may occur, where limited development may occur, and the amount and spatial distribution of land where residential development is likely to take place. Interpretation of development limitations should be based upon local zoning and subdivision ordinances, on-site wastewater sanitary codes, state laws, and Federal laws and regulations.

EIS II-D-1-a The process requires preparation of a base map of the study area and overlays of inventory information at the same scale. The base map should show the planning area boundaries, minor civil divisions, transit systems, and surface water bodies. The overlays of inventory factors that present constraints include such characteristics and resources as physiography, geology, soils conditions, water resources (including wetlands and floodplain areas), sensitive areas such as historic and archaeologic sites, existing land use patterns as well as future land use information derived from local comprehensive plans, zoning ordinances, and subdivision regulations.

All of this information is inventoried as part of the environmental assessment process in planning for wastewater treatment facilities. The information should be compiled in narrative and graphic form for interpretation of those factors that would constrain land development. For all factors examined, the statutory or regulatory basis for constraining the use must be stated to remove subjective judgments.

The constraints mapping process should result in a single map that shows portions of the study area where prohibitive constraints allow no development to occur, where restrictive constraints permit limited development, where qualified constraints reflect policy recommendations, and remaining areas of vacant unrestricted, developable acreage. This map should next be overlaid with existing zoning maps to determine the maximum number of dwelling units permitted per acre. Planimetric measurement or a grid cell overlay of the amount of developable land in each of these districts indicates the total acreage in each category. The amount of land being scrutinized in a given unit of analysis must be carefully considered. The larger a facilities planning area, the greater the population that can be accommodated. In the Seven Rural Lake EIS's, single-tier development was the predominant settlement pattern and was the basis of delineation for proposed service areas. The constraints evaluation was thus conducted on land areas within 300 feet of the lakeshore. In other rural planning areas, service area boundaries should be closely defined in order to evaluate the extent of an area's growth potential. This may be accomplished by consultation with local municipal officials or area residents.

TRD IX-B

EIS VI-D Once the number of dwelling units permitted in the area is calculated, the average number of persons per seasonal and permanent dwelling unit derived from census or other survey data may be multiplied to determine the total population carrying capacity. This calculation should provide a basic upper limit population figure to compare against projections derived from other demographic sources. This figure will not only aid projection, but will also aid in understanding area trends. An analysis of the environmental constraints of an area will facilitate a deeper understanding of the types of impacts that a wastewater management system may generate.

## 2. THE INTERRELATIONSHIP BETWEEN SMALL WASTE FLOWS FACILITIES PLANNING AND LAND USE

TRD XI-A In rural and developing areas, the enforcement of on-site sanitary codes, beginning anywhere from 1945 to the end of the 1960s, has served as a form of land use control (Wisconsin Department of Health and Social Services, 1979; Twichell, 1978). These codes have limited residential development in wetland areas, on soils with a seasonal high water table, including floodplain areas, on steeply sloping areas, and in locations with shallow depth to bedrock because these areas are considered unsuitable for on-site wastewater treatment. Sanitary codes have thus served as a form of de facto zoning, resulting in large lot sizes and a settlement pattern based on suitable soils. The codes have minimized development in some environmentally sensitive areas that would otherwise be unprotected.

Please note that this use of sanitary policy for land use control can have harmful effects. In some states where repair and upgrading of existing systems is considered "new construction," codes have been interpreted to prohibit any upgrading or repair of existing systems. Individual sanitarians have been unwilling to approve repairs or upgrading, to avoid any precedent that might allow further lakeshore development. This not only uses sanitary policy to rule out improvements in sanitation, but forces some residents to think of sewering as the only method that allows community growth. Sanitary and land use policy interact closely, but it is nearly always preferable to consider each openly on its own merits; codes and standards in sanitation should not be used as a crutch to compensate for the absence of goals in land use planning.

EIS VI-B The introduction of new forms of wastewater treatment technology that partially or entirely overcomes unfavorable site conditions, or that takes advantage of more favorable off-site conditions, may enable developers to circumvent these controls. These treatment systems could thus result in significant environmental impacts as a result of the encroachment of housing development on sensitive environmental resources. Also, this could permit a development pattern inconsistent with local goals and objectives. The use of on-site technology such as elevated sand mounds may enable development to occur in areas with a seasonal high water table or shallow depth to bedrock. Off-site treatment such as cluster systems can circumvent on-site limitations altogether and could thus permit development in any of these areas. Impacts from the use of these treatment systems include markedly higher density residential development within existing development areas, a development pattern inconsistent with local goals and objectives, loss of open space buffers between existing developments, and encroachment into environmentally sensitive areas.

EIS III-D To anticipate these impacts, localities should consider conducting land use planning prior to or concurrent with wastewater treatment facilities planning. This would ensure that the suitability of the area for development would be analyzed, that community development goals would be defined, and that appropriate performance standards would be drafted to mitigate impacts of both wastewater treatment facilities construction and associated residential development.

The limited amount of literature available on the land use effects of on-site systems demonstrates the use of sanitary codes to enforce large lot sizes. For example, Twichell (1978) points out that local health officials and sanitarians have often become the permitting officials for new housing development and that stipulation has been made for housing densities of .5 to 2 dwelling units per acre in order to prevent groundwater pollution.

Generalized dwelling unit per acre zoning in the Seven Rural Lake EIS project areas requires .5-acre or larger lots in unsewered areas. Often these lot size requirements have been based on the best professional judgement of sanitarians. These professionals have experienced the need for larger lots because of site limitations or odd lot lines and have recommended larger lots based on the need to protect community health and welfare, not on community development goals.

Alternative on-site technologies may impact lot size requirements. Elevated sand mounds may require larger lots because of larger system areal requirements. Grey water/black water separation systems reduce the areal requirements of the soil absorption system.

However, for public health protection, it is unlikely that well separation distances will be reduced. Thus, lot size requirements may not change. Cluster systems featuring centralized collection and off-site treatment will have the same effect on lot size as large-scale centralized collection and treatment systems. When the public health risk from well contamination is avoided, smaller lot sizes are permitted in local zoning codes. For example, Littlefield Township in the Crooked/Pickerel Lakes, Michigan, area allows 4.5 dwelling units to the acre with the provision of public water and sewer. In the Otter Tail Lake, Minnesota, area, provisions for clustered development in the local zoning ordinance allow for 8 to 9 dwelling units to the acre where central sewer service is provided.

The predominant settlement pattern and housing type with standard septic tank/soil absorption systems is reported as single-family detached units in small subdivisions and dispersed low density sprawl patterns (Twichell, 1978). This development pattern has been determined by access to and the spatial distribution of suitable soil. If on-site technologies continue to be used, this development pattern may lead to a situation where the future option to sewer may be precluded because of the great expense of constructing sewers between dispersed houses. Further dependence upon local sanitary codes may thus severely restrict the amount and distribution of developable land in lake areas. Such restrictions may run counter to local growth plans or subdivision plans of large landholders.

EIS VI-B

One of the most consistent impact findings in the Seven Rural Lake EIS's was that, in the absence of local development controls, centralized collection and treatment systems would induce growth in environmentally sensitive areas such as floodplains, wetlands, and steeply sloping areas. Alternative and innovative forms of wastewater treatment may have similar effects, though to a lesser degree. Historically, sanitary codes have been used as tools to limit or control growth, and as such have become a form of zoning (Wisconsin Department of Health and Social Services, 1979, Twichell, 1978). Some sanitary codes do not permit development of on-site wastewater treatment systems in these marginal areas. However, local municipal officials in many rural lake areas do not have the staff or the budget to conduct land use planning and zoning and do not have formally adopted land use plans. Nor do they have the tools to inventory and analyze their environmental resource base and to formulate performance standards that permit development but prevent significant impacts.

Planning for wastewater treatment facilities gives local municipalities the opportunity to contract for the necessary expertise to conduct land use planning in concurrence with facilities plans. Because the two topics are so closely linked, anticipation of impacts prior to facilities design and formulation of an impact mitigation strategy could save considerable time and expense. An understanding of the environmental resource base, housing types, lot sizes, and existing densities, in conjunction with a program that involves land use planning concurrent with facilities planning, would lead to an environmentally sound wastewater management program.

## E. WATER RESOURCES

TRD II-A XII-A-G XIII-A-C Consideration of water resources was consistently one of the weakest elements in the facilities plans that the Seven Rural Lake EIS's evaluated. Documentation of the water quality reasons for proposing new facilities was generally based on the conventional wisdom that on-site systems should not be allowed near lake shores. Where nutrient models had been developed previously by U.S. EPA, low estimates of phosphorus inputs from on-site systems were played down in the facilities plans. Similarly, predictions of water quality impacts of alternatives, especially nonsewered alternatives, were not well founded on theory or fact.

EIS I-B-3 Early U.S. EPA facilities planning guidance (U.S. EPA, 1975) and administration of Step 1 grants have emphasized the use of available data and have not provided sufficient guidance for needs documentation. Administration of the Construction Grants Program is thereby reflected in the weak consideration of water resources in the original Seven Rural Lakes and countless other facilities plans. It is one of the stated objectives of this EIS to encourage more thorough assessment of water quality in rural areas.

This section emphasizes U.S. EPA interests in water resources and provides suggestions for analysis of water quality needs and impacts.

### 1. Bacterial Contamination

EIS II-A-2 VI-A-1 Pathogen contamination of drinking waters and primary body contact waters by septic tank effluents is unacceptable and, where detected, must be abated. In any case where state standards for untreated drinking water or primary body contact are violated and the source is demonstrated to be an on-site system, the system should be upgraded, replaced, or abandoned as appropriate provided that:

- the fecal coliform counts are above background counts,
- the source is verified to be wastewater by other indicators such as high nitrogen concentrations, surfactants or brighteners, and
- there is a probable hydrologic connection between the suspected wastewater source and the point of use.

EIS II-A-2-a The "point of use" may be an existing well, spring, lake shore, stream bank, potential well sites that comply with state separation distances from wastewater facilities, or other place where use of the water resource may be impaired.

EIS II-D-2-b Care must be taken in applying this policy to drinking water wells that are unprotected against entry of surface water or shallow (0 to 3 feet) percolating water. Sampling of unprotected wells or wells that cannot be inspected should be avoided during surveys to avoid compounding the errors created by false positive results (that is, tests that indicate the presence of wastewater when the source of the indicator is something else). If few of the wells in a community are properly protected, the survey should include analysis of constituents normally found only in domestic wastewaters, such as surfactants or brighteners.

EIS II-D-1-c It should not be necessary to sample for bacteria in every septic leachate plume located during a shoreline scan. An average of five or fewer fecal
C.27. coliform samples per mile of shoreline taken in leachate plumes will provide sufficient data for initial surveys. One or two background samples per mile, including some center lake samples, should be collected from
C.27. locations where there is no development or where no leachate plumes are detected. More intensive sampling may be justified later depending on the findings of the initial survey.

EIS II-D-2-b If results are confused by high background counts or are otherwise ambiguous, it may also be necessary to sample groundwater at the point of plume emergence or on the shoreline between that point and the nearest drainfield. Shallow groundwater sampling can be complicated by mucky or silty sediments, steep banks, or man-made structures. However, small diameter sand points can be fabricated for sampling in sandy or gravelly soils and sediments where bacterial movement would be expected to be most severe.

## 2. Eutrophication

TRD II-D Abandoning septic tank/soil absorption systems along shorelines will seldom result in significant change in lake trophic status. Shoreline septic leachate surveys on the 35 lakes in the Seven Rural Lake EIS study areas and detailed nutrient analysis of 17 individual leachate plumes demonstrated that the limiting nutrient, phosphorus, is normally released to lakes in small quantities. The cumulative phosphorus input of shoreline systems was estimated to be less than 10% of the total phosphorus load for most of the 35 lakes. Elimination of shoreline systems would not have noticeably improved the trophic status of any of these lakes.

This is not to say that improving lake trophic status is not a goal of the Federal Construction Grants Program. However, the nominal improvements expected have not yet been proven to be worth the expense required for sewering rural lakes.

TRD XII-F Exceptions no doubt will be found. Lakes with small watersheds, high densities of on-site systems, or numbers of surface malfunctions that run off into the lake may be substantially improved by abandoning all on-site systems. Figure IV-E-1 has been prepared to assist grantees in recognizing these sensitive lakes. This nomograph relates morphological characteristics of a lake and number of shoreline (within 300 feet) on-site systems to the phosphorus concentration in the lake from on-site systems. This graph can be used with a minimum amount of data to make a preliminary determination on the need for more detailed modeling and field data collection.

C.25. To use Figure IV-E-1 the following data are required:

- number of soil absorption fields within 300 feet of the lakeshore,
- water flow through the lake, Q, in cubic meters per second ($m^3/s$), and
- surface area of the lake in square meters ($m^2$).

These data are then used in the following sequence:

- Areal water load, q, is calculated by dividing flow, $m^3/S$, by surface area, $m^2$, and then multiplying by 31,536 seconds/year.
- The lake's phosphorus retention coefficient, R, is estimated from Figure IV-E-2.
- Convert Q from $m^3/S$ to cubic feet per second (cfs) and calculate the lake's hydromorphological constant, $K = (1-R)/Q$. Locate K on the scaled diagonal, K-K', in Figure IV-E-1.
- The K line is drawn perpendicular to K-K'through K for your lake.
- The intersection of the K line with the vertical line passing through the number of systems near the lake defines the phosphorus concentration resulting from on-site systems as read on the vertical axis.

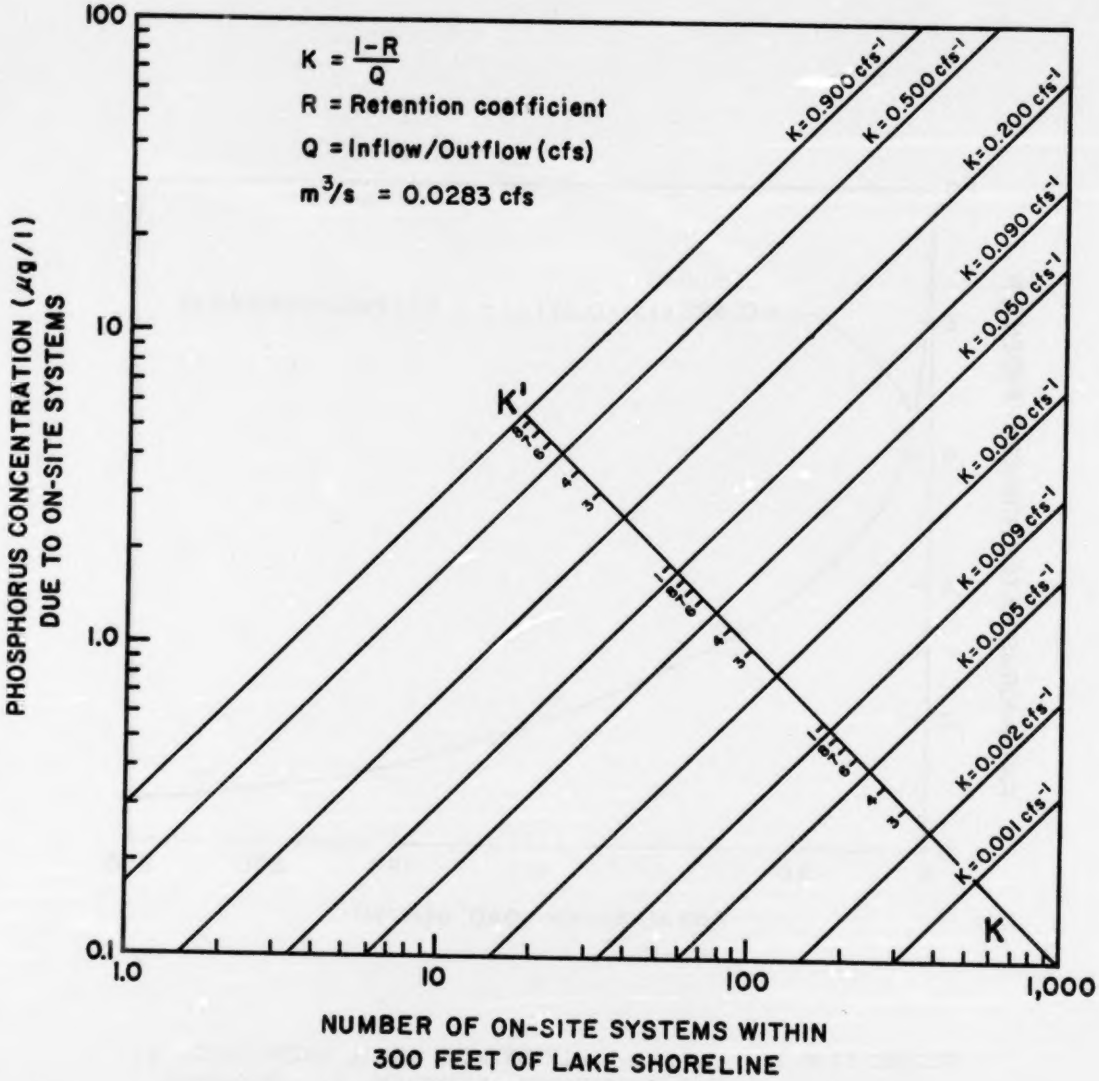

FIGURE IV-E-1. LAKE PHOSPHORUS CONCENTRATION DUE TO ON-SITE SYSTEMS

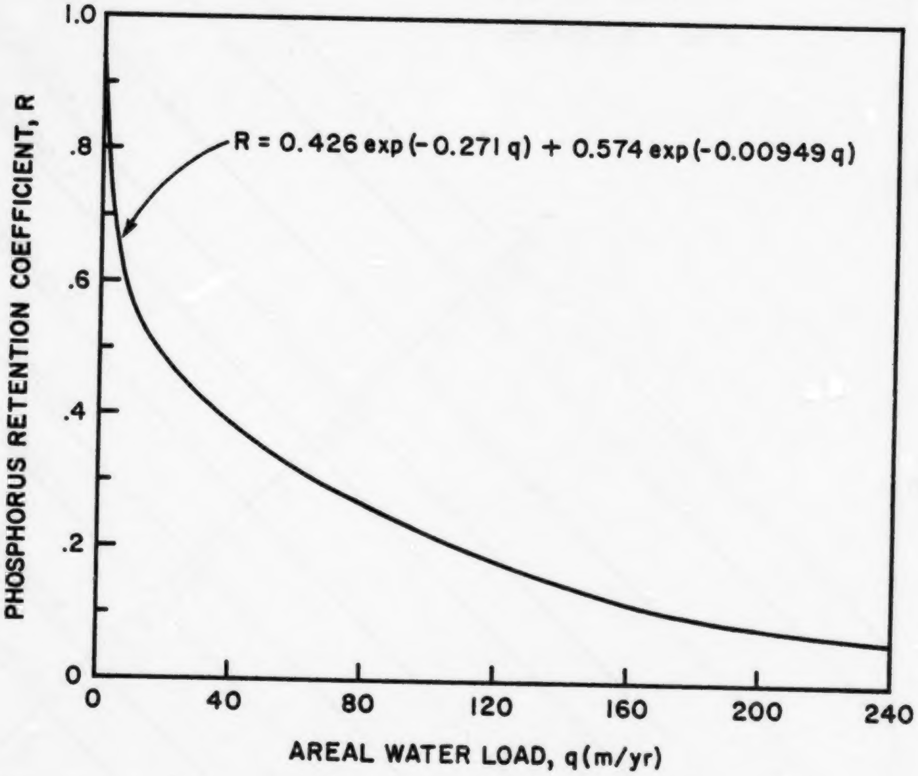

FIGURE IV-E-2. RELATIONSHIP BETWEEN AREAL WATER LOAD, q, AND PHOSPHORUS RETENTION, R. (KIRCHNER AND DILLON, 1975)

TRD XII-A-C

If more detailed modeling is justified, the next level of analysis is based on available data. It includes estimation of phosphorus inputs from major sources such as non-point runoff, precipitation, known point sources and on-site systems. Phosphorus load and lake morphological characteristics are then related to trophic status using empirical models such as that proposed by Dillon (1975).

The preliminary model presented here and the more detailed model are based on a number of assumptions that may not be valid for specific lakes. If choices between alternatives depend on eutrophication impacts or if assumptions are suspected of being inappropriate, field studies may be necessary.

EIS II-D-1-c

For on-site systems, U.S. EPA's National Eutrophication Survey assumes that 0.25 pounds (0.1 kilograms) per year of total phosphorus enters lakes from every person served by on-site systems within 300 feet of lakeshores. This represents 5% to 10% of the phosphorus in raw domestic wastewater on a per capita basis. Based on the modeling and field studies done for the Seven Rural Lake EIS's, this number is judged to be a conservatively high but reasonable average for systems that do not discharge directly or by surface malfunction to glacially formed lakes. In fact, many systems will not discharge to a lake at all. Other systems will have higher inputs. As a check on the 0.25 pounds/capita/year assumption, leachate plume samples collected from open water and during shallow groundwater sampling for bacterial analysis may also be analyzed for filterable total phosphorus. Generally, significant numbers of open water plume samples with phosphorus concentrations above background or of shallow groundwater samples above 1 mg/l of phosphorus indicate that above-average phosphorus loads are entering the lake from on-site systems. Grantees must use their judgment in deciding whether the total estimated input from on-site systems should be changed to reflect field data.

TRD XII-B
TRD XII-D
EIS II-D-1-a

Where available streamflow and nutrient concentration data adequately describe phosphorus inputs from non-point sources, they should be used in developing nutrient budgets. Lacking this information, reasonable estimates can be developed using methods based on the universal soil loss equation or National Eutrophication Survey statistical analysis of tributary data. Long-term sampling and gauging of streams to determine non-point source nutrient inputs will normally not be eligible for Construction Grants funds. Exceptions may be made on a case-by-case basis where reasonable estimates are not otherwise developable and understanding of non-point sources is critical to facilities planning decisions.

### 3. Localized Plant Growth

While on-site system effects on the trophic status of an entire lake are usually minor, localized impacts can be more apparent and of greater public interest. Localized impacts include nearshore plant growth stimulated by leachate plumes at their point of emergence and plant growth stimulated by accumulation of nutrients in embayments or canals. Public interest is generally based on the proximity of plant growth to houses and on residents' fears that local growth will become more widespread.

TRD II-D
EIS VI-A-2

Direct stimulation of aquatic plants, especially the filamentous green alage *Cladophora*, was apparent at plume emergence points studied in detail during preparation of the Seven Rural Lake EIS's. The areas covered by these growths were small but growths were very dense. The most pronounced growths were located on shores underlain by peat deposits. These deposits appear to acidify and chemically reduce groundwater, thereby mobilizing phosphorus which stimulates the plant growth. At their worst, the growths will make swimming unpleasant. Where groundwater is naturally alkaline and aerobic, none of the growths would interfere with recreational use of the lakes or lakeshores. Except for unusually severe cases, preventing these nearshore plant growths in the main body of a lake is not a sufficient justification for abandoning on-site systems. Some kinds of on-site upgrading, such as filter field relocation, gray water/black water separation, and plume interception, may be useful in reducing these growths.

Embayments and canals surrounded by on-site systems often have much more plant growth than adjacent lakes. Lack of mixing and concentrated non-point source loading, as well as septic tank leachate, contribute to locally accelerated eutrophication. Abandonment of on-site systems adjacent to such sensitive parts of lakes may be justified if non-point source control measures are implemented prior to or along with the construction of off-site facilities. These sensitive lake areas are particularly vulnerable to poor design or construction of on-site systems. Filter field relocation or reorientation, gray water/black water separation, or plume interception, as well as more common on-site upgrading, may be helpful.

## F. FINANCIAL IMPACTS

### 1. ASSESSMENT OF MUNICIPAL FISCAL CAPABILITIES

EIS VI-C-2

Communities applying for U.S. EPA Construction Grants funds are required to demonstrate in their facilities plans that they have the necessary financial resources to insure the adequate construction, operation, and maintenance of the proposed facilities.

Municipal fiscal capabilities are determined by investigating the ability of a community to pay for and maintain wastewater facilities. The term "communities" refers to a city, town, county, or special purpose district. First, a community must acquire funds to meet the local share of the capital costs attributed to the wastewater facilities. This generally is accomplished through the use of either general obligation or revenue bonds. Second, the community must be able to bear the total annual debt service costs (principal and interest payments on bonds) and operation and maintenance costs. Indicators of municipal fiscal capability include property values, median family income, community growth characteristics, and the revenues, expenditures, assets, and total outstanding indebtedness of the local government.

The availability of and terms for bonds depend on supply and demand in the bond market and on the nature and size of the planned wastewater facilities project in comparison to the community's fundamental fiscal capabilities. Supply and demand are influenced by regional and national trends beyond the control of a particular community. It will be more difficult for a community to arrange debt financing when funds are in short supply. The community's fundamental fiscal capabilities will affect its ability to obtain funds and will affect the interest rates to be paid on these funds. If the community's fiscal capabilities are marginal, interest charges on bonds will likely be higher. This will further reduce the overall fiscal capabilities of the community.

Communities generally depend on two types of bonds to pay the capital costs of wastewater facilities: general obligation bonds and revenue bonds. General obligation bonds are backed by the "full faith and credit" of the community. That is, they are ultimately supported by the property tax base of the community. Revenues generated by user charges may be used to pay the debt service on general obligation bonds. However, if the revenues are not sufficient to meet debt service payments, the community is obligated to draw upon property taxes to meet payments. In some states, there are ceilings on general obligation debt, and many states require voter approval prior to a community's issuing general obligation bonds. Revenue bonds are usually paid solely through the collection of user charges. Revenue bonds may carry a higher interest rate than general obligation bonds because there is a greater risk of payments not being met.

When evaluating a community's ability to meet bond payments, the financial community (credit-rating firms, investment bankers, and large institutional investors) evaluates the following factors (Moak and Hillhouse, 1975):

- net direct and overlapping tax-supported debt per capita,
- percentage of current property tax delinquency,
- percentage of debt service on tax-supported debt to total revenues of the community's operating budget,
- average life of existing tax-supported debt in terms of general obligation bonds,
- the ratio of projected revenues to the total annual debt service, and
- the ratio of the depreciated value of the community's revenue producing facilities to the outstanding (remaining) bonded indebtedness of the facilities.

Other factors can also indicate municipal fiscal capability. One such factor is the diversity of income-generating sources in a community. Another is the community's past experience with bonded indebtedness. It is more difficult for a community that has never incurred such debts to secure financing than those communities whose past performance can be judged. Dependence on one major industry or company may be a liability because of the possibility of the plant closing or a labor strike. Favorable growth prospects in terms of system users and income is viewed as a positive factor. Finally, the degree of public support after the public is informed of the costs for the undertaking of a wastewater facilities project can serve as an indicator of users' willingness to pay for the facilities once they are constructed (Moak and Hillhouse, 1975).

Certain types of special purpose districts face more problems in securing financing than do cities, towns, and counties. Newly established special purpose districts that do not have property taxing authority will have difficulty raising funds to meet front-end costs. These types of districts also will not be able to issue general obligation bonds and will have to pay a higher rate of interest on debt. New districts, whether or not they have taxing authority, will have no record to prove how reliably they discharge their debts. New districts are, therefore, likely to face higher interest rates.

Both capital costs and operation and maintenance costs must be considered in evaluating the community's ability to pay for wastewater facilities. Wastewater facilities with high capital costs may strain the debt-carrying capacity of the community and may prevent the community from using bonds to pay for other needs such as schools and hospitals. High operation and maintenance costs associated with other alternatives will not strain the community's debt capacity but may place an excessive burden on lower income users and reduce their willingness to pay for the facilities.

Communities should retain the services of a bond attorney. Estimates of the local share of capital costs, operation and maintenance costs, and administrative costs should be submitted to the bond attorney as early as possible in the facilities planning process. Bond attorneys can assist communities in assessing their financial resources and can recommend the types of financing available to the community.

## 2. ASSESSMENT OF ECONOMIC IMPACTS FOR RESIDENTS

EIS VI-C-3
II-F-4

Expensive wastewater facilities may have a significant financial impact on users who will pay the capital and operation and maintenance costs associated with the facilities. Average annual homeowner costs measure the costs that residents will have to pay. These charges are calculated as discussed in Section II.F.4.

The U.S. EPA has provided a guide for judging whether a project will have an adverse effect on the finances of users (U.S. EPA, Facilities Planning, 1981, March, 1981 and Construction Grants - 1982, May, 1982). Under this guidance U.S. EPA considers projects expensive when the average annual user charges (including debt retirement) are:

- 1% of median household incomes less than $10,000.
- 1.5% of median household incomes between $10,000 and $17,000.
- 1.75% of median household incomes greater than $17,000.

A project having average annual homeowner costs exceeding these income limits is likely to place a burden on system users and may prevent the community from meeting debt service obligations. Communities proposing facilities with higher user charges should satisfy themselves, the potential users, and state or Federal review authorities that all less expensive alternatives have been rejected for good cause.

EIS IV-B-4 In any community, some users will pay a higher percentage of their incomes than the project price guidelines. Estimation of the percentage of users thus affected by various wastewater alternatives provides another useful basis of economic comparison. Percentage of users likely to experience financial burdens is determined by comparing average annual homeowner costs with the statistical distribution of household income in a community. The financial burden may cause families to alter their spending patterns substantially by diverting money from their accustomed expenditures. In the case of low incomes, the burden may be severe enough to cause households to be displaced, that is, move out of the wastewater facilities service area. A "rule of thumb" was used to estimate displacement pressure in the Seven Rural Lake EIS's. Displacement pressure was considered to be placed on residents if user charges were equal to or exceeded 5% of a household's annual income. Financial burden and displacement pressure can be estimated only on the basis of annual homeowner costs. Owing to data limitations, valid estimates of impacts on specific user groups ordinarily cannot be made.

Average annual homeowner costs may vary from the actual user charges depending on the way in which private costs are to be paid. House sewers, hook-up fees, front-footage assessment, and flow reduction devices are private costs to be paid by users. A community may require these costs to be paid during the first year of the system's operation instead of having them averaged in with user charges over the life of the project. If private costs are paid during the first year, then actual first-year user charges will be higher and future user charges will be lower than the average annual user charges. Under this scenario, the initial year financial burden will be much more severe than it will be in following years. The method by which private costs are paid is not a decision made by U.S. EPA.

Front footage or benefit-based assessments should be carefully evaluated for economic effect on households and the community. Seemingly small unit assessments can result in extremely large total assessments for large areas, such as farmland within district boundaries.

### 3. BENEFITS FROM LOCAL PROCUREMENT OF GOODS AND SERVICE

EIS VI-C-5 Wastewater alternatives utilizing small waste flows systems and flows reduction devices can have a positive impact on a community's economy. The construction of centralized systems generally involves the use of contractors and equipment from outside the local area. Optimum operation alternatives, however, involve local contractors, labor, and supplies to a greater extent and keep the funds spent on the project within the community. For example, equipment for centralized wastewater facilities must usually be obtained directly from manufacturers and wholesalers outside of the local area. But flow reduction devices may be available from local hardware and department stores and septic tank suppliers, installers, and pumpers are found in most communities. Local laborers may be employed to construct and operate both centralized and small waste flows alternatives, but on-site alternatives rely on local laborers to a greater extent and require their work over a longer period of time. On a community-wide scale, the use of local goods and services associated with on-site wastewater alternatives may partially offset any negative economic impacts resulting from growth restrictions imposed by minimum lot size restrictions and bans against room additions.

## G. PUBLIC PARTICIPATION

TRD XIV-A

Planning for wastewater facilities in rural and developing communities provides opportunities for public participation not available normally in urbanized settings. In particular, the inspection, evaluation, and construction of on-site facilities will result in numerous contacts between individuals in the community and planning personnel. These contacts can provide a personalized forum for explaining the purpose and methods of the project. The contacts can also be a way for citizens to provide input to the planning process.

EIS II-D-1-b&c
II-D-2-a

The primary opportunities for personal contact will be during sanitary surveys. The interview with which each on-site sanitary inspection starts can be partially devoted to discussing the project as a whole. Other opportunities for discussion will arise during field checking of aerial photography, septic leachate detector surveys, and other field work.

During these contacts, it would be most helpful if field workers were well-informed about the project as well as their own task. While the contacts are an excellent means of gathering and spreading information, they can also generate and perpetuate misinformation. If field workers are not well briefed, therefore, they should have knowledgeable project personnel available to respond to citizen's questions in a timely manner.

Property owners will also want to be involved in selection of the facilities required on their property. Their first opportunity for this will likely be public hearings on facilities plans. At this time, technologies selected on a tentative basis should be reviewed with interested owners. Maps indicating the tentative selections should be posted at the meetings for this purpose. Facilities planners should be prepared to explain the basis of selection and to discuss additional steps that will be taken to confirm or modify the selection.

EIS II-A-4

If the on-site sanitary inspection or other information indicate a need for on-site construction, the next step will be a detailed site analysis. The site analysis may require minor excavation and other property disturbances. Property owners should, therefore, be given reasonable notice prior to the work so that they may attend. Reasonable care in preserving the property's appearance at this point and during construction will also help preserve the owner's cooperation.

EIS III-D

Some property owners may object to the facilities specified on the basis of site analysis. They may have a feasible alternative in mind which minimizes their cost or disruption to their property. On the other hand they may want the public to help pay for a larger or more elaborate system than is necessary. One method for dealing with disputes between property owners and facility designers is a sanitary review board. Analogous to a zoning board, a sanitary review board would include citizens of the community whose job it would be to weigh owners' concerns against public concerns about cost, water quality, and public health.

Depending on the role the community takes in operation and maintenance, the need for effective public participation may not end with Construction Grants activities. Communities will, no doubt, find cooperative and individual means for dealing with their own citizens.

# Chapter V

## Funding and Administering the Optimum Operation Alternative-Mitigative Measures

MINNESOTA
WISCONSIN
MICH.
MICHIGAN
ILLINOIS
INDIANA
OHIO
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**United States**
**Environmental Protection Agency**
**Region V**

# CHAPTER V

# FUNDING AND ADMINISTERING THE OPTIMUM OPERATION ALTERNATIVE--MITIGATIVE MEASURES

One important short-term impact of the Optimum Operation Alternative, whether implemented with Federal funding or not, is the way in which it raises new administrative questions and requires new local or even state administrative structures to work well. This chapter describes some of the mitigative steps taken by the Agency, Region V, and other steps available to the states to overcome this largely psychological hazard by answering these questions--both in general and as they affect the Construction Grants Program.

Only a limited number of optimum operation projects have yet been build, operating under only a limited range of conditions, thus leaving many important questions unanswered. Similarly the legal authority and administrative structure needed for proper project operation may vary considerably among the several states of the Region or even within those states. Typical questions of this kind have involved the legal authority for establishing an on-site wastewater management district, available means of training, eligibility of particular treatment methods for state or Federal funding, and many others.

Some of these questions have required U.S. EPA clarification in Regional or even Agency guidance. Several states and many municipalities have requested advice as to how to respond to questions of this kind, even apart from the Construction Grants Program. This chapter represents the first time some of the most recent clarification and guidance of this type has been brought together in one place. It also offers an update of some questions still being discussed.

## A. FEDERAL CONCERNS

The 1977 amendments to the Clean Water Act made many kinds of treatment systems eligible for Federal funding that had previously been the sole responsibility of their owners. This of course raised many questions, especially about the eligibility of some on-site treatment systems under various special circumstances. Many of these were resolved in the subsequent Program Requirements Memoranda (PRM's) and more recently in Facilities Planning - 1981 and Construction Grants - 1982.

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Legend for Cross-References in Margins

| | |
|---|---|
| EIS I-C-2 | Section of this EIS |
| TRD II-A | Section of the Technical Reference Document published separately |
| CWA 201(g)(1) | Section of the Clean Water Act which necessitates change in the text |
| 40 CFR 35.2110 | Section of the Construction Grants regulations which necessitates change in the text |
| CG 82-6.2. | Section of the program guidance document, Construction Grants - 1982, upon which change was based. |
| C.26. | Comment on the Draft EIS relevant to topic discussed (see Chapter VII) |

All significant changes from the Draft except new sections are identified by underlining.

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On some questions, however, individual states differed as to the precise meaning of the PRM's, requiring regional guidance, or even clarification by Agency headquarters. The Regional Guidance on Needs Documentation was one example of this, as was the July 16, 1980, memorandum of the Facilities Requirements Division on use of local ordinances to establish access for on-site maintenance.

## 1. ELIGIBILITY ISSUES

### a. Seasonal Properties

Publicly owned collection and treatment facilities serving seasonally occupied dwellings were eligible for Federal funding long before the 1977 amendments to the Clean Water Act. The text of the 1977 amendments and the associated regulations (40 CFR 35.918(a)(2) and 35.2005(b)(18) specifically excluded privately owned "individual systems" serving seasonal properties from the definition of an individual system. Although there are good arguments that can be made against any Federal subsidy to seasonally operated treatment systems, this would have resulted in a confusing situation with only the (usually) less cost-effective alternatives being fundable.

EIS V-A-3-a

Therefore, in order to be eligible for Construction Grants funding of upgrading or replacement, systems serving seasonally used properties must be publicly owned. For purposes of making grant determinations, seasonally used systems will be considered to be publicly owned if (1) the applicant can provide assurance of access to the systems at all reasonable times for such purposes as inspection, monitoring, building, operation, rehabilitation and replacement, and (2) these activities will be provided by or under the supervision of a public management agency. Local or municipal ordinances granting access and control would satisfy these requirements for public ownership (see Section V-A-3-a).

Thus for seasonally occupied residences, access and control, rather than simple patterns of use, are the determinants of eligibility. Of course along with access, actual need and cost-effectiveness of any alternative must be demonstrated. Together they allow selection of the most cost-effective and environmentally sound alternative.

## 2. INTERAGENCY COORDINATION

### a. Incorporation of Property Value Changes in Cost-Effectiveness Analysis

Property values can be affected by the adequacy of the wastewater facilities serving the property. The value-added concept is the amount of value added to a property as a result of availability of utilities such as roads, water, electricity, and wastewater disposal. The availability of these utilities usually makes a property more valuable. Centralized facilities and public on-site wastewater districts can add to the value of property by minimizing failures and preventing potential public health hazards and nuisances. The U.S. Department of Housing and Urban Development (HUD) uses the value-added concept when reviewing a developer's or community's application for HUD mortgage insurance. HUD generally requires that public facilities be provided if the costs do not substantially exceed the value added to the property by the facilities. HUD appraisers determine the definition of the phrase "substantially exceed" based on whether or not the cost of public facilities would cause the project to be noncompetitive with surrounding housing costs. Public facilities generally are considered to mean centralized facilities. However, a strong case can be made for including publicly managed on-site systems in the definition of public facilities.

It is difficult to assess the value added to property by having public management of on-site systems. Because the approach is so new and data are incomplete, it is impossible to make valid statements on its effects on property values. More data are available for assessing the value added to property values by centralized facilities. However, in comparing centralized and small waste flows facilities, a cost-benefit analysis should not be used that includes the value added to property by centralized facilities and neglects the value added by public management of on-site systems.

Although the net impact would be positive, two factors may minimize the amount of property value added by public management of on-site systems. The first factor is the stigma attached to septic tanks by many persons who may place more value on property served by centralized facilities, regardless of performance. The second factor relates to the degree to which flow reduction measures that affect lifestyle are required. Water restrictions such as a ban on room additions, shorter showers, etc., do limit the way that property can be used. Property with these restrictions is less valuable than property where such restrictions have been circumvented through the provision of centralized facilities.

As a policy, current cost-effectiveness analysis guidelines do not allow inclusion of property value changes. A theoretical case can be made for including such values as monetized social impacts. However, since there are no data or experience with which to estimate the property value changes associated with the optimum operation alternative, incorporation of values added is not practical.

### b. Application of the Davis-Bacon Act to Small-Scale Construction Projects

TRD XVI-E

The Davis-Bacon Act is a Federal law that regulates the wages paid to laborers and mechanics under Federally funded construction contracts. The act requires contractors and subcontractors to pay at least the prevailing wages paid corresponding classes of laborers and mechanics working on projects of similar character in the area where the Federally funded construction is to be performed. All U.S. EPA funded wastewater facilities construction projects are subject to the Davis-Bacon Act.

The purpose of the act is to protect the stability of local area wage rates. "Local area" is defined by the act as the city, town, village, or other civil subdivision of the state in which the work is to be performed. Surveys of prevailing wages in various trades and various types of projects throughout the nation are conducted by the U.S. Department of Labor (DOL).

The Davis-Bacon Act can cause problems for communities trying to implement an optimum operation alternative. When there is no project of a similar character in a rural area, the DOL bases its wage determination on "similar" projects in the nearest urban areas. "Similar" projects in terms of the optimum operation alternative can include large-scale urban wastewater treatment facilities that currently are classified by DOL as "heavy construction projects."

Most of the companies that would be contracted to carry out the optimum operation alternative are small firms that have had little or no experience with Federal regulations promulgated under the Davis-Bacon Act. Firms with few employees may have to pay the same worker at different rates for different types of jobs performed. This situation can create worker dissatisfaction and bookkeeping confusion. Contractors are required to post specified wage rates at the construction site and to pay at least once a week the full amount due their workers according to the wage rates set by the Secretary of Labor. This requirement can add several hours of bookkeeping time each week for a small contractor. Small contracting firms with little experience in dealing with U.S. EPA projects may be discouraged from bidding on U.S. EPA funded projects as a result of the Davis-Bacon Act requirements. This would reduce competition and possibly increase the cost of projects.

U.S. EPA can take steps to lessen the impacts of the Davis-Bacon Act on on-site facilities contractors. The act enables Federal agencies funding construction activities to request DOL to establish a project wage determination based on individual projects until enough data have been collected by DOL to establish general wage guidelines for these types of projects. DOL should be requested to change the classification of small waste flows projects from heavy construction to commercial or residential. Finally, U.S. EPA and state Construction Grants agencies can take the initiative to educate smaller businesses on the requirements of the Davis-Bacon Act.

## 3. MISCELLANEOUS

### a. Use of Local Ordinances for Access

40 CFR 35.2110

40 CFR 35.2110 requires access to individual systems in order for them to be eligibile for Federal funding. Within a very large on-site wastewater management district with many residents, or within a very small one with particularly limited administrative capabilities, acquisition of individual easements with a detailed legal description may be complex, costly and imprecise, particularly in those states not surveyed according to the Township and Range method, or where a "meets and bounds" legal description must be used.

Because of these concerns, U.S. EPA's Facilities Requirements Division, on July 16, 1980, in a memorandum to Mr. Charles Sutfin, U.S. EPA Region V Water Division Director, stated that a local or municipal ordinance granting access and control would also be considered equivalent to public ownership. This, along with the "Fill in the blanks" easement form described below, should make organization and management of on-site wastewater district considerably easier. Access by ordinance is also particularly useful when there is no Federal funding at all.

### b. Pilot Studies

CWA 212 (1)
204 (d)(1)
40 CFR 35.2118
40 CFR 35.2262

The reliability and long-term performance of many alternative wastewater processes are unknown. To develop performance data and determine the local feasibility of a particular wastewater technology, the use of pilot studies is desirable. The 1981 Amendments to the Clean Water Act make field testing of alternative and innovative technologies eligible for Construction Grant funding. The Act also requires that the engineer responsible for a project direct its operation and train operating personnel. These provisions cover both the construction and operational supervision needed for the pilot studies. In addition, the new Construction Grant regulations permit the Regional Administrators to approve field testing of alternative and innovative technologies as preliminary Step 3 work. That is, field testing may be started before actual award of a grant for other planned facilities. The requirements are that the approval could avoid significant cost increases due to delay and that the environmental review for the project as a whole be completed.

### c. Performance of Field Work (New Section)

CWA 201(1)(1)
CWA 201(1)(2)

The Municipal Wastewater Treatment Construction Grants Amendments of 1981, Public Law 97-117, prohibits grant funding of facilities planning and design (Step 1 and 2). Instead, allowances based on a percentage of total project cost will be used to help defray the costs of planning and design. "The allowance is not intended to reimburse the grantee for costs actually incurred for facilities planning or design. Rather, the allowance is intended to assist in defraying these costs. Under this procedure, questions of equity (i.e., reimbursement on a dollar-for-dollar basis) will not be appropriate." Proposals for allowance percentages to apply for planning and design range from 5.6 percent for the largest projects up to 13 percent for building costs of $100,000. (Proposed rules for 40 CFR Part 35, Subpart I, Appendix B published in the May 12, 1982 Federal Register.)

EIS II-F-1

The law and regulations have significant implications for analysis and implementation of the optimum operation approach by small communities. Protection of water quality and public health with this approach absolutely depends on thorough field work to locate and analyze problems with individual systems. Based on assumptions and cost estimates for the optimum operation alternative prepared in support of this EIS (see Section II-F-1), the cost of detailed site analysis ranges from 23 to 183 percent of building cost. And this does not include review of available data or community-wide surveys that are considered to be needs documentation. Nevertheless the total construction plus site analysis costs averaged only $475 to $3,900 per house of which the detailed site analysis was $307 to $720.

The incentive to do thorough field work lies in the cost avoidance resulting from not building unnecessary facilities. However, Region V's concern is that, if funds for field work come only from Step 1 and 2 allowances, communities may allocate insufficient money for other necessary, but less rewarding, planning and design tasks. The result, predictably, will be facilities plans and other parts of grant applications that will need to be returned to applicants.

This EIS makes several recommendations which are intended to help applicants keep costs of field work to a necessary minimum. Sequencing of field work with decision making steps, a decision flow diagram for selecting appropriate technologies, and opportunities for self-help are discussed in Chapter II.

## 4. REGIONAL CONCERNS

### a. Conventional Water Use

State 201 agencies, notably in Minnesota, have stressed the need for funded upgraded and replacement facilities to be designed for conventional design flows as used in designing new facilities. The supporting argument for this position is that substandard facilities will fail in the future.

EIS II-A-5

Where standard on-site treatment facilities can be installed, this is obviously the preferred course of action. However, on many existing developed lots, full-sized facilities may not be feasible. Staying on-site may require flow reduction devices; limitations on building additions; prohibitions on garbage grinders, dishwashers, or clothes washers; subcode sized drainfields and/or advanced on-site treatment (mounds, sand filters, dosing, etc.). Where these measures have a reasonable chance of remedying failures, they should be implemented and be eligible for funding unless off-site facilities can be shown to be cost-effective.

EIS VI-E-2

The use of flow reduction devices and prohibitions on water-using appliances may sometimes affect homeowner convenience. However, this policy places higher priorities on water quality improvements and cost-effectiveness. It is based on prior findings that subcode systems can often perform adequately and that avoiding off-site facilities is the key to maximizing cost-effectiveness in unsewered areas. The policy relies on careful site analysis to assess both the causes of malfunction and the operability of the subcode systems.

### b. Potential Failures

EIS II-D-2-a Contrasting philosophies have been encountered in determining eligibility for the upgrading and replacement of on-site systems. Several state and local officials currently favor an approach that correlates eligibility with compliance with current design codes. This philosophy holds that, where existing systems do not substantially meet key design criteria, they should be abandoned and replaced with funded on- or off-site facilities that meet the codes. The assumption behind this approach is that nonconforming systems will fail.

On the other hand, some Federal and state officials interpret Construction Grants regulations as prohibiting the funding of any construction that does not remedy an on-going water quality or public health problem. In recognition of the potential for future failures, this approach would include or recommend the establishment by the grantee of a reserve fund for any future failures.

The Seven Rural Lake EIS's, Region V's Guidance for needs documentation, and this EIS take an intermediate approach to eligibility. Existing systems identified as potential failures because of obvious underdesign and other factors would be eligible for funding provided these systems are similar to systems that have already failed. Similarity is measured by system design, usage, soil characteristics, site limitations, site drainage, and groundwater hydrology, as appropriate.

### c. Simplified Easement Forms

Access to individual systems required by 40 CFR 35.2110 does not necessitate a new property line survey of every individual dwelling, especially in states that use the township and range survey method. In such states the exact legal description of the property may commonly be obtained from county tax rolls, allowing use of a simple "fill in the blanks" easement form. Figure V-A-1 shows a sample easement form of this type developed by residents of Benzie County, Michigan.

### d. Innovative and Alternative Off-site Facilities

In many communities that adopt the optimum operation approach, some of the developed lots will never successfully support on-site systems. Innovative and alternative off-site facilities such as holding tanks, cluster systems, or other small-scale treatment methods will be eligible for Federal funding if:

1. a public health or water resource contamination problem is documented that cannot be abated by any combination of on-site conventional, innovative, sub-code, flow reduction or waste restriction methods, or
2. the life cycle costs of off-site treatment and disposal for an individual building or group of buildings is less than the costs of appropriate on-site technologies for the same buildings.

EIS II-F-3 Innovative and alternative off-site facilities may be included in optimum operation alternatives for purposes of cost-effectiveness analysis and environmental assessment as indicated by partial sanitary surveys and representative sampling. Selection of an off-site facility as an alternative depends, as always, on its cost-effectiveness and environmental soundness. However, unless needs documentation conclusively demonstrates that on-site methods will not be operable, final eligibility determinations for proposed off-site facilities will be contingent on completion of on-site sanitary inspections, detailed site analysis (where indicated), and microscale cost-effectiveness analysis.

Figure V-A-1

## SEWER EASEMENT AND RIGHT OF WAY

(I)(WE) ______________________________________________

______________________________________________________

______________________________________________________

of ___________________________________________________

______________________________________________________

______________________________________________________

respectively, in consideration of the prospective benefits to be derived from a new or upgraded sewer and/or improved water quality in Crystal Lake, do hereby convey and release to the ______________________________ an easement and right of way for unlimited access to the present or future on-site sewer system or other systems of sewage disposal, at all reasonable times for such purposes as inspection, monitoring, construction, maintenance, operation, rehabilitation, and replacement, over, upon and across lands owned by (me)(us) and situated in the Township of ________________, County of Benzie, State of Michigan, and more particularly described as follows:

In witness, whereof, I have hereto set my hand this ______________ day of ________________, 19___.

WITNESSES:

____________________________ ____________________________

____________________________ ____________________________

____________________________

____________________________

STATE OF ________________) ss.
)
COUNTY OF _______________)

Subscribed and sworn to before me this ______ day of ___________, 19__.

____________________________
Notary Public

My commission expires:

## B. STATE CONCERNS

### 1. ADDRESSING REGULATORY AND INSTITUTIONAL REQUIREMENTS OF THE OPTIMUM OPERATION ALTERNATIVE

The implementation of the optimum operation alternative may require changes in existing state regulatory and institutional requirements. Specific topics that will need to be addressed include regulatory requirements pertaining to existing systems; the authority to manage private wastewater systems; the authority of a community to acquire access to privately owned wastewater systems; and policies relating to the granting of variances for individual systems. These topics are discussed in this section.

TRD XV-A

The right to continue to utilize on-site systems constructed prior to adoption of current design standards is an issue that has not been directly addressed in most states. Current regulations appear, by omission of statements to the contrary, to allow the continued use of these systems until such time that the systems fail. Once a system has failed, it is normally required to be upgraded to code conformance if possible. Minnesota statutes, however, require automatic upgrading for some types of nonconforming systems, failing or not. If local communities are to have the option of considering use of the optimum operation alternative, state policies toward the continued use of existing systems may have to be reconsidered. Rights to the continued use of systems should be specified, as well as when upgrading will be required. Requirements for the upgrading of existing systems may also be made more flexible and site-specific to allow local governments discretion in requiring upgrading based on local conditions rather than a set of uniform standards.

Illinois is the only Region V state that has granted explicit authority to local governments to manage on-site systems. Small waste flows management agencies can be established in the other Region V states under implicit authority granted to certain public bodies to manage centralized wastewater facilities. The interpretation of implied authority will vary from state to state and may be challenged in courts on the grounds that the authority to run publicly owned facilities does not imply authority to manage privately owned on-site facilities. Thus, while small waste flows management programs can be operated on the basis of implied authority, there is a need in each state to test these implied authorities judicially or to grant explicit authority to certain public agencies.

EIS III-F
V-A-4-c
TRD VIII-A

Inherent in any community management program for privately owned individual systems is a means for the management agency to obtain access to these systems. Methods of obtaining access have already been discussed in Sections III-F and V-A-4-c. Regulatory and institutional powers within each state should be reviewed and amended as appropriate to provide management agencies with the necessary access capabilities.

EIS III-E

TRD VII-A

State control over local variance decisions may be desirable in recognition of potential problems arising from improper administration of variance requirements and the lack of uniformity in granting variances throughout the state. However, flexibility in variance requirements would be desirable to allow local governments to adapt variance requirements to local conditions.

Innovative technologies used to solve existing problems are characterized by a less certain level of risk for system failure than risks with conventional technologies. However, assumption of somewhat higher risk may be justifiable by economic savings associated with the use of these technologies. State policies toward the use of innovative technologies should reflect the trade-off between risks and economic savings and ensure that the systems do not prove to be future economic liabilities.

## 2. STATE PLANNING ACTIVITIES FOR SMALL COMMUNITIES

EIS III-K

TRD XV-C

Small communities involved in the management of small waste flows systems can be assisted by various state planning activities. Many of these activities normally could not be carried out by the local community because of lack of expertise or authority. U.S. EPA policies toward the improvement of wastewater facilities are founded on the goals of improving water quality and protecting public health. State and local communities may, however, have additional goals associated with the improvement of wastewater facilities, such as the promotion of growth, housing development, and economic recovery. These goals may in fact be considered higher priority in many rural areas. In this context, states could assist local communities in defining local goals and wastewater needs. Where these goals may be inconsistent with U.S. EPA goals for Construction Grants funding, the state may assist the local community in finding alternative funding sources or in a reassessment of goals.

Illinois provides a prime example of the type of planning assistance for wastewater facilities that a state may provide for rural communities. In recognition of the lack of facilities planning for small communities, the Illinois EPA and designated 208 agencies prepared Municipal Needs Analyses (MNA) for communities with populations over 200. These MNA's were less detailed than typical facilities plans, but they did define and project communities' wastewater needs and provide recommendations to meet these needs. In a number of communities, these recommendations consisted of the continued use and upgrading of on-site systems.

EIS IV-A-1&2

State and regional planning assistance may also be utilized in defining rural areas where wastewater improvements are needed. For rural lake communities, use of Section 314 lake inventories will identify lakes with major pollution problems and identify corrective measures to control pollution sources. Such corrective measures may include the upgrading of existing wastewater facilities, including on-site systems. In non-lake areas, regional and county assistance may also be utilized in delineating rural areas with wastewater needs. Chapter IV, Section A-1, has discussed approaches for defining planning area boundaries.

TRD XV-D

State Construction Grants Programs should consider the use of separate priority lists for funding small community projects. None of the states in Region V currently uses a separate priority list. Small communities with substantial unsewered development have wastewater problems as severe as problems in larger communities with centralized facilities. However, the conventional measures of severity such as population and volume of pollutants are not appropriate measures for problems in unsewered areas. Comparisons among predominantly unsewered areas would more equitably be based on the factors that define a community's obligation to take action: development density, failure rates, and sensitivity of water resources.

EIS III-A-2

Establishment of a small community or unsewered areas priority list with separate funding would avoid unrealistic comparisons of need between urban and rural communities.

## 3. STATE GRANT AND TECHNICAL ASSISTANCE

Small communities encounter many problems in participating in the Construction Grants program. Lack of an effective administrative and management structure to deal with the Construction Grants process and the lack of personnel with expertise in the Construction Grants process or wastewater technology are major reasons for these problems. The U.S. EPA (1980d) has identified the major problems small communities have with the Construction Grants process as:

- difficulty in meeting the program's administrative requirements,
- problems with managing consulting engineers,
- problems in dealing with U.S. EPA, the state, and the Corps of Engineers,
- problems in employing the environmental assessment process,
- difficulty in meeting the accounting requirements for post-grant audits, and
- difficulty in structuring local share of financing and determining affordability.

To overcome some of these problems faced by local communities, a state or regional 208 or similar regional agency could provide management assistance to the local communities. Such management assistance could range from providing technical assistance to assuming full management responsibility for the community's Construction Grant. States that have been delegated responsibility for administering the Construction Grants Program have been authorized to use Federal funds to manage waste treatment construction grants for small communities. This authority is given by Section 205(g) of the Clean Water Act.

U.S. EPA has developed four models describing potential "third party" assistance to local communities in managing Construction Grants and wastewater facilities (EPA, 1980d). Two of these models are based on existing state programs in New Hampshire and Maryland. The other two are the circuit rider model and the contractor assistance model. These four models are discussed below.

### a. New Hampshire Model

In this model, the state agency would develop a staff to negotiate contracts for all or some specified number of small communities within the state. The state staff would develop a "prequalified" list of consultants to be submitted to a community for selection. The community would pick three preferred firms with which the state staff would negotiate. State staff involvement would be the greatest during Step 1; the staff would monitor the consultant's and community's progress during Steps 2 and 3, but not as actively.

This type of assistance program would relieve local communities from the responsibility of negotiating and managing contracts with consulting engineers and would provide a centralized staff for all small community wastewater grant assistance, thus greatly streamlining the grants process. Local communities may resent the loss of their local authority, however, and local consulting engineers may resent not being able to work directly with the communities. This type of program would tend to work best in smaller states where close contact between the communities and the state staff can be maintained.

### b. Maryland Model

This management model involves the establishment of a non-profit corporation to provide assistance to small communities. The corporation could provide a wide variety of services to small communities dependent on the contractual requirements with an individual community. Services may include the review of facility plans; the planning, design, construction, and operation of treatment facilities; and acting as the community's agent in application for grants and negotiating contracts.

The corporation may be more responsive to community needs and concerns than a state staff since it relies on the communities for its existence. The corporation could also be more flexible than state agencies in providing and tailoring assistance to a local community's needs. The corporation would have to have a close working relationship with the state regulatory administration to be effective. State subsidy of the corporation may also be necessary to keep down local costs.

### c. Circuit Rider Model

The state regulatory agency could also establish through direct hiring or contract a series of "circuit riders" who would provide technical assistance consisting of planning, design and construction, financial planning, or actual operation and maintenance of the treatment facilities.

The circuit rider could provide quick and efficient service and provide a liaison between the local communities and the state. This approach is well-suited to larger states where several circuit riders may be required to maintain close community contact. Problems may arise from the lack of uniformity of work performance among circuit riders and their personal ability to deal with communities. This option would be costly in a state with a large area and small population, but might be practical for smaller areas such as those served by a 208 or regional planning agency.

### d. Contractor Assistance Model

Under this option, the state would contract with a private firm to provide special assistance to local communities. Contractors would then conduct site visits to small communities, assess community needs, and provide appropriate assistance.

This option would allow the state to provide contractor assistance to those areas of greatest need. The state would only pay for assistance that is actually utilized by the small communities. The cost for the assistance could be shared by the local community. State management of contractor's assistance would be required. The ability of the contractor to work effectively with the local community, state personnel, and a community's facilities planning consultant will be a key to the success of this approach.

## 4. STATE STAFFING

Present manpower involved in the regulation of on-site systems in Region V is difficult to quantify. Sanitarians are normally the personnel involved with the regulation of these systems. Identification of the number of sanitarians in each state could therefore provide a measurement of manpower levels. However, there are problems with this method. First, not all sanitarians will be involved in on-site regulation because of the broad range of typical sanitarian duties. Illinois is the only state in Region V requiring sanitarians to be registered, allowing for an accurate assessment of total manpower. Other Region V states have voluntary registration programs that make assessment of total manpower difficult. Furthermore, Wisconsin does not have a sanitarian classification as such involved in the regulation of on-site systems. Wisconsin requires on-site inspectors to be certified as plumbing inspectors, system installers to be licensed as master plumbers, and soil evaluators to be certified as soil testers. Estimates of total existing manpower within the limitations discussed are given in Table V-B-1.

TRD X-E There are approximately 3.3. million on-site systems in Region V. Existing state management of on-site systems is primarily limited to permitting new systems and repairs, installation inspections, and responding to complaints. In some areas of Region V, even these minimum regulatory services

TABLE V-B-1. ESTIMATES OF PERSONNEL INVOLVED IN REGULATION OF ON-SITE SYSTEMS

| | | |
|---|---|---|
| Illinois | 1,189 | Registered sanitarians |
| Indiana | 680 | Voluntarily registered and unregistered sanitarians |
| Michigan | 550 | Voluntarily registered and unregistered sanitarians |
| Minnesota | 329 | Voluntarily registered sanitarians |
| Ohio | 775 | Voluntarily registered sanitarians |
| Wisconsin | 3,111 | Certified plumbing inspectors and 3,000 certified soil testers |

are not provided. Based on assumptions developed and presented in the Technical Reference Document, Chapter X-E., perhaps 1.1 million systems in the region may eventually be publicly managed through their entire life-cycle. To the extent that greater state and local roles in the regulation and management of on-site systems are assumed, additional trained manpower will be required.

TRD VI-D

EIS III-K

Optimum operation alternatives will require manpower for initial implementation, continuing operation and maintenance. During the implementation phase, personnel will be required for planning (including needs documentation), design, and construction. These personnel may include facilities planners specialized in small waste flows applications, system designers, inspectors, soil scientists, laborers, equipment operators, environmental and financial planners, small waste flows contractors, and water resource scientists. Once the alternative is implemented, personnel such as administrators, clerks, inspectors, wastewater system operators, and laborers will be required to insure proper operation and maintenance. Definitive estimates on the types and quantity of personnel required are impractical because of the wide range of variables affecting both manpower requirements and the number of potential small waste flows projects.

## C. TRAINING

TRD VI-F&G

An effective small waste flows management program relies on competent personnel to perform a myriad of tasks related to small waste flows management. This required competency is gained through experience and training. Because of its widespread use and acceptance, a wealth of training and experience has been gained in conventional centralized wastewater technology. There is a definite recognized need for improved training of multidisciplinary personnel to work in small waste flows management.

Training programs of many types are offered throughout Region V by a variety of sponsors. Training programs in most states have some excellent aspects, but no one state appears to have developed a comprehensive training program for all levels of personnel involved in small waste flows management.

Better training programs in small waste flows technology are required at many levels. At the university level, more classroom training should be provided in the use of small waste flows wastewater technology. Traditionally, university training in wastewater treatment has focused on conventional technology and on large-scale treatment works. Little emphasis has been placed on on-site and other alternative wastewater treatment technology. Even schools with degree programs in environmental health science, which are often considered as sanitarian training programs, do not normally extensively cover the topic of small waste flows technology. Few of these programs incorporate the "hands-on" training necessary to train an individual fully, and only one program, at Ferris State College in Michigan, was identified as having an entire course devoted to the subject. Classroom training is available at many colleges and universities in subjects directly associated with small waste flows technology, such as soil science, hydrology, geology, and related subjects.

Training programs for field personnel such as system designers, installers, and soil testers are continually needed to keep personnel informed of new developments. These programs may be offered by universities and state, regional, and local levels of government, as well as by trade associations. The Home Sewage Treatment Workshops sponsored by the University of Minnesota Extension and the Minnesota Pollution Control Agency, as well as various workshops offered by the University of Wisconsin-Extension, are excellent examples of these programs. Another example of such a program is the two day course on alternative system design offered by U.S. EPA through its Small Wastewater Treatment Clearinghouse.

Universities can also develop research and demonstration projects in aspects of small waste flows management. Through these projects, universities can develop and disseminate valuable information concerning new technology and other matters related to the field. Two universities in Region V, the University of Wisconsin and Purdue University, are performing research and developing demonstration projects that further the current knowledge of small waste flows technology. These programs should be supported, encouraged, and fostered at other universities.

Improvement is also necessary at the on-the-job or preservice training level for regulatory personnel involved in small waste flows management. Most states provide no formal training for new employees. Training that is provided depends upon the place of employment. In some instances, this means that new employees will receive inadequate, incomplete, and/or incompetent training. The State of Ohio has an excellent voluntary preservice training program that includes 4 weeks of classroom and 12 weeks of on-the-job training. The Ohio program is a model for this type of training program. Indiana also provides a 1-week orientation session that includes about 8 hours of training in small waste flows technology.

A final level of training that is often neglected involves homeowner education. Homeowners need to be instructed in the proper maintenance procedures for their individual on-site systems. As the need for homeowner maintenance increases with the use of more technologically complex systems, the level of homeowner education should also be increased. Examples of homeowner education programs include educational brochures describing on-site systems that have been published by the University of Wisconsin and the University of Minnesota extension services. The University of Wisconsin also offers a dial-a-cassette recording for receiving information over the telephone related to on-site systems. Homeowner education can also be provided locally by public meetings, workshops, and dissemination of information related to on-site systems.

## D. DOES ANYONE WANT THE SMALL WASTE FLOWS APPROACH?

TRD XVI-A

There are many reasons why small communities seek Construction Grants funding for improvement of local wastewater facilities. U.S. EPA, however, is limited to granting such funds to communities that demonstrate that they will use the funds to limit the discharge of pollutants and to improve local water quality. Silverman (1980) has identified four common community concerns associated with improved wastewater facilities, each of which may be an important impetus for a community to improve their wastewater facilities and to seek Construction Grant funds:

- avoiding prosecution,
- malfunctioning septic tanks,

- residential and commercial growth, and
- industrial growth.

How these community concerns are addressed by the use of the optimum operation alternative will determine in part the desirability of this approach. These issues are discussed below.

## 1. AVOIDING PROSECUTION

A basic reason for communities to improve their wastewater facilities is to avoid being prosecuted for noncompliance with state and Federal regulations governing effluent discharges and water quality. Since most communities are not currently liable for individual systems, this concern would be absent in communities not served by a centralized wastewater system. Therefore, communities with small waste flows systems likely have other reasons for improving wastewater facilities.

## 2. MALFUNCTIONING SEPTIC SYSTEMS

A major reason why communities seek wastewater improvements is to correct problems, real and perceived, associated with the use of on-site systems. As has been discussed in this EIS, properly operated and maintained on-site systems, and even neglected systems, have been found to be effective means of wastewater treatment. Traditionally, however, on-site systems have been looked upon as inferior in comparison to conventional wastewater facilities. This practice has led to the sewering of areas where on-site systems could have continued to operate satisfactorily. The use of the optimum operation alternative will address this concern by insuring that on-site systems are properly operated and maintained and that problems associated with their use, if they do occur, will be quickly recognized and corrected. While this may remedy the actual causes for community concern with on-site system use, public education may also be required to change traditional attitudes toward these systems.

## 3. RESIDENTIAL AND COMMERCIAL DEVELOPMENT

Many communities wish to improve or expand wastewater facilities, particularly collector sewer systems, to promote residential and commercial development in suburban and rural areas. When such sewers are paid for in large part by Federal money, this development broadens the community's tax base and improves the community's economic status through relatively small local investments. While the Clean Water Act was clearly not enacted to promote rural development, it must be recognized that sewers funded under the act have been precursors of rural development.

Where communities wish to use sewers to promote such growth, the use of the optimum operation alternative would not be desirable. However, the use of the optimum operation alternative along with liberal state and local policies for the use of alternative systems may allow the development of land previously considered undevelopable. Where this level of development still does not satisfy a community's goals for residential and commercial development, alternative sources of funding for sewers may be sought.

## 4. INDUSTRIAL GROWTH

Associated with the use of sewers to promote residential and commercial development is their use to attract new industry and to service existing ones. Clearly, the use of the optimum operation alternative lends itself only to small industrial wastewater flows. Where industries are existing or desired within a community, they may have to provide their own treatment capabilities, or other sources of funding to improve wastewater facilities may be required.

# Chapter VI

# Environmental and Social Consequences Of The Proposed Action

# CHAPTER VI

# ENVIRONMENTAL AND SOCIAL CONSEQUENCES OF THE PROPOSED ACTION

Widespread use of the design and operation method described in Chapters II and III would produce its own impact. Like all other alternatives, it entails its own particular mix of trade-offs. Like on-site treatment in general, it is heavily dependent on intelligent installation and management. If this is available, however, it can provide water quality improvements closely comparable to those of any other alternative at a cost far below that of any alternative other than No Action. For literally hundreds of rural lake projects, the optimum operation alternative may offer the greatest degree of water quality improvement for an affordable level of community expenditure.

The planning, design and management methods of Chapters II and III have an even broader application. They can be used to isolate portions of largely off-site projects where optimum operation may be feasible, and to arrive at a just determination of the action needed, of whatever kind.

## A. WATER QUALITY IMPACTS

### 1. GROUNDWATER

### a. Problems and Solutions

Any alternative involving improved operation of on-site treatment systems will result in continued discharges to groundwater. Septic tanks will probably be the most common source of these. Implementation of the proposed alternative will allow identification and inventory of local sources and impacts of these discharges. Continued reliance on upgraded surface and subsurface land disposal will reduce, but not eliminate, impacts of existing discharges to groundwater.

EIS II-A-2-a Many existing facilities such as cesspools, bottomless septic tanks, and poorly installed drainfields are not providing the degree of treatment possible. On some sites, points of groundwater use may not be protectable due to unfavorable geohydrologic conditions. An objective of the optimum operation alternative is to detect and eliminate or upgrade sources of

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Legend for Cross-References in Margins

| | |
|---|---|
| EIS I-C-2 | Section of this EIS |
| TRD II-A | Section of the Technical Reference Document published separately |
| CWA 201(g)(1) | Section of the Clean Water Act which necessitates change in the text |
| 40 CFR 35.2110 | Section of the Construction Grants regulations which necessitates change in the text |
| CG 82-6.2. | Section of the program guidance document, Construction Grants - 1982, upon which change was based. |
| C.26. | Comment on the Draft EIS relevant to topic discussed (see Chapter VII) |

All significant changes from the Draft except new sections are identified by underlining.

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contamination. Totally unsatisfactory systems can be replaced. Drainfields can be redesigned, rebuilt, or relocated to minimize groundwater impacts. Gray water/black water separation can largely eliminate nitrate loadings to groundwater.

EIS III-H-1

The key to reducing impacts of existing discharges is adequate identification and analysis of problems followed by selection of appropriate remedies. In addition to changes in the wastewater system, remedies may include reconstruction or relocation of the well. The long-term success of either type of remedy must be monitored by periodic sampling.

EIS III-H-1
IV-E-1
TRD II-A
XII-A-C

Nitrate and bacterial contamination are the chief concerns related to septic tank effluent discharges to groundwater. At the housing densities and in the hydrogeologic settings studied in the Seven Rural Lake EIS's, contamination of wells by septic tank effluent was not shown to be a problem. The low density, linear development, and lack of fractured or channeled bedrock in the study areas appear to preclude well contamination even in areas of high groundwater. Indeed, high groundwater may actually protect wells since well screens used in many glacial deposits draw water from levels deeper than the effluent plumes.

### b. Future Work Needed

Contamination of groundwater by viruses and toxic substances that may be discharged with sewage are unresolved concerns. Insufficient data exists to define either the prevalence or public health implications of such contamination. Thus, while this EIS gives broad support for the continued use of on-site systems, it also recognizes the need for better analysis of this concern than is now possible. Therefore, Region V will work with the states in the Region to establish funding procedures for analysis of viruses and toxic substances in wells. As an initial proposal, this EIS recommends:

- sampling of selected, properly protected wells previously found to exceed bacterial or nitrate standards and suspected of contamination by nearby on-site systems,
- concurrent sampling of suspected wastewater sources, and
- because of cost, limitation of sampling to single facilities planning areas representative of each physiographic province in the region.

In California and New York, use of toxic septic tank cleaners (especially trichloroethane) in certain kinds of on-site treatment systems (especially cesspools installed in very high density) have been implicated in areawide toxic contamination of aquifers. Limitations on the use of toxic cleaners on a nationwide basis (possibly by the Federal Trade Commission or the Consumer Products Safety Commission) deserve serious considerations.

### c. Information Needed for Assessment

In facilities planning areas characterized by linear, single- or double-tier development in nonfractured and nonchanneled geology, description of groundwater resources based on available well logs and sampling data augmented by representative sampling of properly protected on-site wells will normally suffice for assessing impacts of on-site systems on groundwater. In other settings, the existence or possibility of adverse impacts should be assessed by a professional geologist or hydrogeologist.

## 2. LAKES

The optimum operation alternative is likely to impact bacterial and nutrient input to lakes. The two chief concerns are (1) whether on-site treatment systems contribute a significant share to lake loading, and (2) whether the systems are properly designed or installed.

### a. Bacterial

EIS II-D
III-H-2
IV-E-1

TRD XII

Bacterial contamination can be identified by available survey and sampling methods. The most likely routes of bacterial contamination from existing on-site systems are direct discharges and overland runoff of surface malfunctions, almost all of which are remediable under the optimum operation alternative. Groundwater transport of bacteria to lakes is possible but appears to be rare. On-site systems in sandy or gravelly soils and very close to lakeshores are suspect and should be examined as sources of bacterial contamination. On- and off-site technologies are available to remedy bacterial contamination of lakes.

### b. Nutrients - General

Impacts of wastewater nutrient inputs can include increases in the aquatic productivity of a lake as a whole and localized stimulation of plant growth. Localized stimulation may be at the point of plume emergence or in sensitive parts of lakes such as embayments and canals. The optimum operation alternative can, however, reduce or eliminate lake nutrient input resulting from direct discharges or surface runoff.

EIS IV-E-2

Nutrient inputs to most lakes from on-site systems are generally small when compared to total nutrient loads. The nutrient of primary concern is phosphorus. Except in small lakes with high lake surface area to watershed area ratios and with large numbers of nearby on-site systems in sandy soils, the beneficial impact of abandoning the systems on lake trophic status will be small. Trophic status improvements alone will seldom be a supportable reason for abandoning on-site systems.

Facilities planners for rural lakeshore communities will be required to prepare phosphorus budgets for alternatives considered. This EIS presents a modeling tool to use for making preliminary estimates of phosphorus inputs from on-site systems. More rigorous models are also available to analyze lake trophic status.

### c. Nutrients - Local

EIS IV-E-3

Accumulation of phosphorus from on-site systems in poorly mixed parts of a lake can result in nuisance plant growth well in excess of growth in the main body. Where it can be demonstrated that 1) on-site systems are substantially contributing to nuisance plant growth, 2) abandonment of on-site systems is cost-effective, 3) all other nutrient control methods have been evaluated including non-point source control methods, and 4) the community will commit to implementing other methods that are practically and economically feasible, then facilities that allow abandonment of on-site systems adjacent to such sensitive parts of a lake will be eligible.

Plant growth at the point of effluent emergence into the open waters of a lake seldom interferes with recreational or other uses of the water. Availability of suitable substratum, wave action, and fluctuations in lake level normally control such nearshore plant growth naturally before it becomes a nuisance. On-site upgrading and replacements may incidentally reduce this growth, and innovative techniques such as effluent plume recovery may eliminate it. Abandonment of on-site systems adjacent to the main body of lakes solely for the purpose of controlling nearshore plant

C.20.,23.,24. growth will not be eligible unless the growth impedes beneficial uses of the water and is shown to be stimulated by wastewater effluent.

## B. ENVIRONMENTALLY SENSITIVE AREAS

EIS IV-D-2
TRD XI-A-C
TRD IX-A

In rural and developing communities, any form of wastewater treatment technology will have some impact on environmentally sensitive areas. Historically, some of these areas were protected by on-site sanitary code prohibitions and by the fact that on-site systems will not operate in them. Sewers can overcome the natural constraints to development in such areas and result in permanent environmental damage. These impacts include construction in and development encroachment on floodplains, wetlands, prime agricultural lands, aquifer recharge areas, steep slopes, habitat for rare and endangered species, as well as historic and archaeologic sites. These impacts will also occur with off-site treatment provided by cluster systems, but limitations on the size of collection and absorption systems will also limit the degree of impact. Innovative on-site technologies can circumvent some site limitations and may permit development in sensitive areas. Again, the degree of impact will probably be less than with centralized systems.

### 1. FLOODPLAINS

Executive Order 11988 on floodplain management requires that U.S. EPA deny Federal funding to projects that induce growth in floodplain areas. In the Seven Rural Lake EIS's, no long-term impacts were anticipated from secondary development in floodplain areas because most areas had zoning ordinances or other development regulations. Some short-term impacts are anticipated from construction of cluster system collection sewers. However, proper erosion and sedimentation control measures would mitigate these impacts.

Some rural lake areas such as the Crooked/Pickerel Lakes Study Area in Michigan have no inventory, mapping, or zoning exclusion for floodplain areas. Cluster systems, shallow placement, or elevated mound systems may overcome site limitations in these areas and thus encourage development.

### 2. WETLANDS

Wetlands are afforded protection by Executive Order 11990 which calls for the denial of Federal funding for projects that might induce secondary development there. In general, small waste flows systems are not anticipated to cause significant impacts in wetland areas. Wetland site conditions usually will not permit any form of on-site waste treatment. Construction of even small-scale cluster system collection lines in wetland areas, however, may require dewatering that can result in the decomposition of peaty or organic substrate and thus significantly alter wetland character. Construction may also alter the hydrologic flow patterns in the wetlands. These collection lines may also induce development in or contiguous to wetland areas where no development codes exist. In a number of the Seven Rural Lake project areas, there was no delineation of wetland areas or development codes that would prevent development. As a result, dredge and fill may occur, buffers may be destroyed, and housing construction may be induced in wetland areas.

### 3. PRIME AGRICULTURAL LANDS

The regulations established by the Environmental Protection Policy Act require identification and evaluation of impacts on significant agricultural lands. The regulations implementing U.S. EPA's Agricultural Lands Protection under the Construction Grants Program state that no award should be made for wastewater collectors in a new sewer system "unless the system would not provide capacity for new habitations...to be located on environmentally sensitive land such as wetlands, floodplains, or prime agricultural lands" (40 CFR 35.925-13(d)). Cost-effectiveness guidelines of these regulations, Appendix A, state that interceptors should not be extended into prime agricultural lands unless they are necessary to eliminate point source discharges or to accommodate flows from existing habitation.

Small waste flows technology, as proposed in the Seven Rural Lake EIS's, was estimated to have limited or no impact on prime agricultural lands in rural lake areas. This was in part due to the spatial distribution of the agricultural lands being removed from somewhat poorly drained lakeshore soils. In some cases, steeply sloping land contiguous to lakeshore areas also prevented encroachment on prime agricultural lands.

However, small waste flows systems may potentially impact prime agricultural lands. Because these lands are often relatively flat, well-drained upland areas, they are also highly suitable for septic tank/soil absorption systems. If sufficient market demand exists, prime agricultural lands near lakeshore areas could experience development pressure.

EIS IV-D-2

Because small waste flows result in more scattered low density residential development patterns, this type of technology may result in more agricultural land being devoted to residential uses. Often, zoning provisions permit higher density development in areas provided with centralized wastewater treatment; thus, clustered development may occur. As an example of this, the Seven Rural Lake EIS's estimated that 40% more land would be required to serve the same population with small waste flows systems than with centralized facilities.

## 4. AQUIFER RECHARGE AREAS

The impacts of small waste flows systems on drinking water aquifers may stem from bacterial, organic, suspended solids, and nitrate-nitrogen contamination. In areas with soil texture finer than sand, bacteria, organics, and suspended solids in wastewater are readily removed by downward movement through 3 to 4 feet of soil. High concentrations of nitrates in groundwaters are of concern because methemoglobinemia may occur in infants who consume such waters. At high densities, septic tank/soil absorption systems are suspected of causing groundwater nitrate-nitrogen levels to be in excess of the 10 mg/l national drinking water standard. If this correlation is established in a sole source drinking water aquifer recharge area, the U.S. EPA administrator may deny financing to projects proposing additional decentralized facilities (40 CFR 149.10(a)).

None of the Seven Rural Lake EIS's anticipated that small waste flows technologies would have any significant harmful impact on drinking water aquifers. This was in large part due to the linear development patterns that minimize overlapping of leachate plumes and resultant accumulations of nitrates. In addition, some forms of treatment (cesspools, etc.) most likely to lead to aquifer contamination would normally be eliminated. Where hazards to the aquifer are severe, certain forms of on-site treatment such as gray water/black water separation or plume interception can greatly reduce nitrate hazards.

## 5. STEEP SLOPES

A common impact in the Seven Rural Lake EIS's was encroachment of development on steep slope areas. Induced development may occur on unstable hillside areas with resulting erosion, sedimentation, and thus a probable increase in non-point source pollution. In those communities with significant development pressure this would occur to a lesser extent with small waste flows systems than with centralized facilities.

## 6. HABITAT FOR RARE AND ENDANGERED SPECIES

Because the rate, amount, and distribution of development dependent on small waste flows systems is moderate compared with centralized facilities, none of the Seven Rural Lake EIS's anticipated any impact on rare or endangered species. It is conceivable that lower density residential development may be induced in or adjacent to habitat areas with resultant human activity. This activity could have the effect of altering species diversity or stability.

## 7. HISTORIC AND ARCHAEOLOGIC SITES

Impacts on these resources were difficult to assess in the Seven Rural Lake EIS's because inventories were largely incomplete. Much more effort is needed to incorporate this resource information into facility design. Anticipated impacts include possible induced growth infringement on or contiguous to sites on the National Register of Historic Places. Facility construction could also result in the destruction of below-ground resources. As a result, a Phase 1 archaeological survey may be required for Federally funded small waste flows systems including proposed on-site facilities on private property (36 CFR 800.3). State Historic Preservation Officers determine where archaeological surveys must be conducted for Federally funded projects.

The Phase 1 reconnaisance survey requires the specialized knowledge of a trained archaeologist who would be able to inventory the cultural resources of an area and identify their significance. The survey would involve small scale field analysis of known and potential sites as well as an inventory of sites identified by local, state, and Federal interests. Documentation would map and describe the local resources in order to mitigate possible impacts.

Please note, however, that the shoreline development requiring wastewater treatment has itself commonly led to site disturbance that reduces or eliminates potential for further damage from on-site treatment repair or upgrading. Because not all systems may require upgrading or replacement, the potential for direct impacts on undisturbed sites is substantially lower for an on-site treatment approach than for a sewered approach.

## C. ECONOMIC IMPACTS

## 1. PRESENT WORTH SAVINGS IN THE REGION

EIS I-C-2-a

TRD X-E

An estimated 13% of all on-site systems in Region V could be either sewered or publicly managed under an optimum operation alternative. For these 430,000 systems the estimated difference in present worths between the two approaches is $1.9 billion, an average of $4,436 per dwelling.

Several assumptions on which these estimates were based cannot at present be verified. However, it is felt that local and state initiatives to improve rural sanitation will have more effect on the ultimate savings than will improvements in the assumptions.

## 2. COUNTY AND MUNICIPAL GOVERNMENTS

EIS IV-F-1

The economic impacts of the optimum operation alternative will typically be less severe than the impacts associated with conventional centralized wastewater facilities. The capital costs of small waste flows technologies are less than the capital costs of centralized facilities. As a result, the local share that county and municipal governments must pay will be reduced. The local share is reduced further by the fact that the U.S. EPA will fund 85% of grant eligible costs of small waste flows systems in comparison to the 75% funding of conventional centralized facilities.

Depending on the state matching grant, the local share of capital costs will range from 6% to 15% of the project's total capital costs.

Many states have statutory limitations on the amount of debt that can be incurred by municipal and county governments. Implementation of the optimum operation alternative will enable local governments to incur less debt than they would under conventional centralized alternatives because of lower capital costs and local share. The Seven Rural Lake EIS's indicated that publicly financed local costs were reduced between 89% and 98% under some on-site alternatives. Local governments will be able to use their credit for schools, hospitals, and other community facilities rather than for needlessly expensive wastewater facilities.

Operation and maintenance costs will not be reduced in proportion to capital reductions but will generally be lower than with properly maintained conventional facilities. As with conventional centralized facilities, operation and maintenance costs associated with the optimal operation alternative can be passed directly to users. County and municipal governments that had previously required property owners to bear all the costs and responsibilities of on-site systems will incur some administrative costs, due to the increased role of local governments in systems management under the optimum operation alternative. Because of the flexibility local governments have in the actual design of small flows management agencies, they can match their costs to the actual severity of local water quality problems.

## 3. PRESENT PROPERTY OWNERS

EIS IV-F-2

In unsewered communities where the optimum operation alternative is feasible, the economic burden on present property owners, as a group, will be less than it would be if a conventional centralized alternative were selected. Owners with funded on-site systems will receive a combined Federal and state subsidy of 85% to 94% on upgrading, site investigation, and design services in return for a 6% to 15% contribution toward planning. Other residents not receiving the subsidy may contribute toward the local costs of planning, depending on the local decision on voluntary or compulsory participation in the small waste flows management program. Financial burdens and pressure placed on lower income residents to move from the service area to avoid expensive user charges (displacement pressure) will be relatively low.

TRD VIII-B

The actual economic burden placed on present property owners may vary from residence to residence depending on the manner in which capital, operation and maintenance, reserve fund, and administrative costs are allocated. How these costs are distributed is a decision that will have to be made at the local level. Communities may decide to spread all costs evenly among all users. Under this scenario, the severity of the economic burden placed on owners will be solely a function of each owner's income. If the community decides to allocate the costs based on the actual costs of serving a specific residence, then economic burden will vary depending on the site limitations, type of technology chosen, and the specific costs for insuring proper system function. For some owners such as those using holding tanks, these costs may be higher than the costs associated with centralized facilities. The economic burden may be severe, regardless of income, for owners having to pay high costs of site limitations.

## 4. FUTURE PROPERTY OWNERS

Future property owners served by on-site systems will have to pay the full capital cost of their new systems exactly as they would without any management system. U.S. EPA policy is not to subsidize future growth through the Construction Grants program. Future capital costs for on-site systems are deferred over the 20-year project period and are unlikely to be funded by local government.

Certain lots may require a very expensive on-site technology. The individual costs on these lots in the future may equal or exceed the individual shares of subsidized centralized facilities, if these facilities were available. In cases where sewered off-lot technologies are selected over on-site alternatives. the magnitude of economic impacts on future property owners will be locally determined.

### 5. UTILITY CONTRACTORS AND LOCAL EQUIPMENT SUPPLIERS

EIS IV-F-3

Use of small waste flows technologies in rural areas can have a positive impact on local utility contractors and equipment suppliers. Most construction services and equipment for on-site and small-scale technologies can be locally supplied. In contrast to conventional centralized facilities where outside firms are typically used, optimum operation alternatives may lead to the retention of more local, state, and Federal funds in the rural community. The conventional contractors' objections to and unfamiliarity with small waste flows technologies may indicate their inability to compete successfully with local firms. Competition for contracts to construct and provide supplies for small waste flows systems is likely to come from non-local firms that have established expertise with these technologies. The degree to which Construction Grants funds are retained locally will depend on the ability of local contractors to perform work on government contracts. In some cases, the project workload and the meeting of Federal contracting regulations, such as the Davis-Bacon Act, may be more than small rural area firms can handle.

### 6. MINERAL PRODUCTION

Construction of replacement soil absorption systems will require gravel or crushed stone. Some systems will also require select fill of loam, sandy loam or sand. When a number of systems are constructed in a community at the same time, demand on local sand and gravel or stone quarries may require increased production rates. Coordination with quarry operators could avoid construction delays.

Sand and gravel deposits are present throughout the states in Region V. In 1978 all six states were in the top ten states for sand and gravel production. Ohio, Illinois, and Michigan were in the top ten for crushed stone production (U.S. Bureau of Mines, 1978, 1979a-e). On state or regional levels, therefore, increased gravel, crushed stone, and sand demands for construction of soil absorption systems will have little impact on mineral production.

## D. LAND USE

EIS IV-D-2

TRD XI-A&B

Optimum operation alternatives may affect the amount, rate, and density of development in communities within a reasonable commuting distance of employment centers. Often, large lot size requirements are called for by local sanitary codes to protect the quality of groundwater used as domestic water supply. These lot size requirements for new dwellings will probably not change as a result of adopting alternative on-site treatment technologies. The net effect of such constraints on new development may be adverse or beneficial depending on local community development objectives.

Cluster systems using off-site soils circumvent development controls based on sanitary codes and soils limitations. Cluster systems may thus permit considerably higher density residential development. High density development may be counter to local development objectives. Cluster systems may permit infilling within existing development areas resulting in loss of open space buffers between existing development, and possibly into areas unsuitable for residential development. Multifamily systems could have a positive impact where higher density planned development permits conservation of open space in contiguous areas.

The predominant settlement pattern and housing type in the Seven Rural Lake EIS communities were single-family detached residential units in single-tier development around lakeshore areas. Other rural areas depending on on-site technology are also single-family units in small subdivisions or in dispersed low density patterns. This pattern has been determined by transportation access to lots and by spatial distribution of suitable soils. If on-site technologies continue to be used, this development pattern may lead to a situation where the future options to sewer may be precluded because of the great expense incurred in constructing sewers between dispersed homes. Further dependence upon local sanitary codes may thus severely restrict the amount and distribution of developable land in lake areas. Such restrictions may be counter to local development goals as well. Wastewater treatment planning offers local municipalities an important chance to save on land planning concurrently with preparation of a facilities plan. Because the two topics are so closely linked, anticipation of impacts prior to facilities design and formulation of an impact mitigation strategy could save considerable time and expense. An understanding of the environmental resource base, housing types, lot sizes, and existing densities, in conjunction with a program that involves land use planning concurrent with facilities planning, would lead to an environmentally sound wastewater management program.

## E. RESIDENT PRIVACY AND INCONVENIENCE

### 1. INTRUSIONS ON PRIVACY

EIS III-A-2 Local access and control over on-site systems, although required by both the Clean Water Act and common sense, raise concerns about individual privacy and the sanctity of private property. The establishment of on-site permit requirements a generation ago raised similar concerns. A poorly planned, designed or funded version of the optimum operation alternative might not offer benefits worth the costs that it incurs, whether in money or privacy. Any transfer of authority to government reduces individual choices, and may make some residents feel helpless, or more nearly so. For this reason community authority should be exerted tactfully and sparingly, balancing public health and water quality needs against any infringement of privacy.

If something more than individual initiative and present management practices is necessary, what are the differences in privacy between sewering and the optimum operation alternative? The amount of money that must be paid for wastewater treatment could be considered one measure of intrusion into people's lives. On this basis, the optimum operation alternative will be less of an intrusion in any case where it is cost-effective. In another sense, the legal requirement to abandon one's on-site system and connect to a sewer is as severe an intrusion on private property as any physical intrusion by inspectors or meter readers.

For the resident whose on-site system is causing no problems and is meeting current design standards, short-term intrusions will include a one- or two-hour interview and site inspection during the sanitary survey and possibly a return visit for well water sampling. Continuing intrusions would include periodic (1 to 3 years) site inspections by a surveyor, routine septic tank pumping every 2 to 5 years and, for lakeshore dwellings, possible groundwater and surface water monitoring activities along their beaches. Some of these residents may be asked to allow well sampling at the same time. All these intrusions can be minimized by careful advanced notice and mutual agreement on public entry.

For residents whose on-site systems require repair, replacement, or upgrading, intrusions caused by detailed site analysis and construction will be roughly comparable to laying out and installing house sewers. Either could require modification of interior plumbing that can be disruptive as well as annoying. Intrusions resulting from on-site system construction will affect only a fraction of the total residents in a service area, whereas all residents connecting to sewers will be affected.

For certain on-site systems needing repair, replacement, or upgrading, continuing intrusions would also be greater than with properly designed and operating systems or with gravity sewers. On-site pumping units need inspection and maintenance perhaps once or twice per year. If water flows must be metered for hydraulically limited systems, meter readers would enter the premises perhaps once per quarter. In general, continuing intrusions will be related to the complexity of the facilities necessary to deal with site limitations; the more complex the facilities, the more maintenance would be required.

Intrusions will be greatest for residences required to install holding tanks. Visits by the pump truck can be embarrassing as well as disturbing. This (as well as nuisances and costs) can be minimized by constructing holding tanks with hopper bottoms and riser pipes with quick-lock fittings and by installing flow reduction devices in the house.

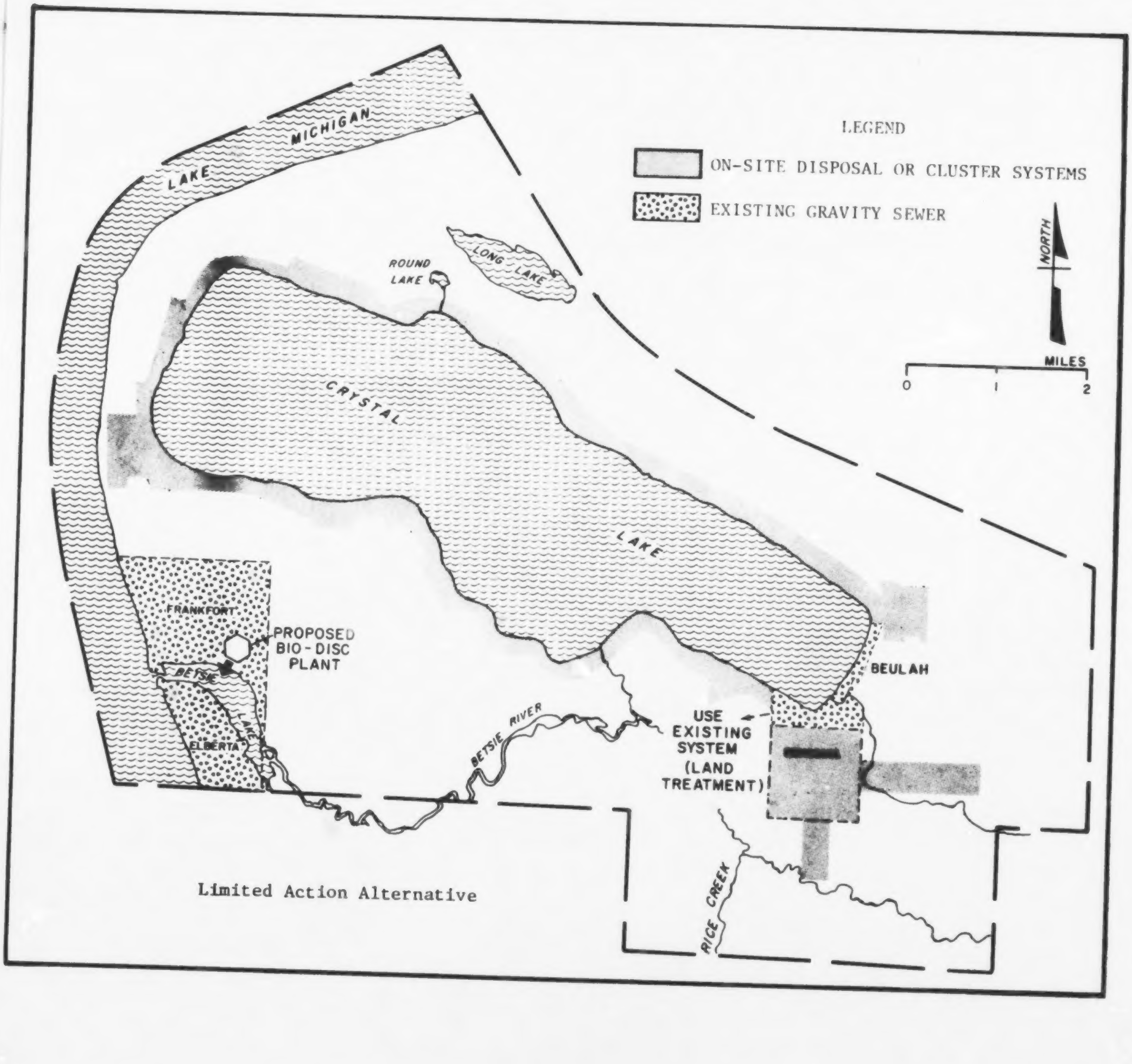
## 2. REMOVING RESTRICTIONS TO WATER USE

TRD XVI-A

For many properties, modification of on- and off-site small waste flows facilities will remove practical restrictions to water use. New or upgraded systems may handle dishwashers, clothes washers, garbage grinders, and additional occupants, which previously were avoided or prohibited. Some properties will not be so fortunate, such as those on small lots for which existing, subcode, or innovative facilities will be adequate with minimum water usage and for which off-site facilities are not affordable.

# Chapter VII

# Comments on the Draft EIS and Responses


LEGEND
ON-SITE DISPOSAL OR CLUSTER SYSTEMS
EXISTING GRAVITY SEWER
NORTH
MILES
0
1
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LAKE MICHIGAN
ROUND LAKE
LONG LAKE
CRYSTAL LAKE
FRANKFORT
PROPOSED BIO-DISC PLANT
BETSIE LAKE
ELBERTA
BETSIE RIVER
USE EXISTING SYSTEM (LAND TREATMENT)
BEULAH
RICE CREEK

Limited Action Alternative

# CHAPTER VII

# COMMENTS ON THE DRAFT EIS AND RESPONSES

U.S. EPA received numerous letters on the Draft Generic EIS following its distribution in October, 1981. Many of these letters just confirmed receipt of the document. These letters are not reproduced here and are not responded to in this chapter.

Those letters which commented substantively on the Draft EIS are reproduced here. Specific comments are paraphrased and responded to in the initial pages of this chapter. Portions of letters from which comments were paraphrased are identifed by notations on the letters. Also, cross-references to specific comments are included in the text of the Final EIS.

## The EIS Process

C.1. Is the intent of this EIS to eliminate future EIS's for rural lake projects or to act as a guideline for project-specific EIS's and to aid communities in planning, construction, and management? (Smit)

R.1. The EIS is not a substitute for future EIS's on rural lake projects. Current guidelines for deciding to prepare EIS's will continue to be applied to individual projects.

The EIS is not intended to act as guidance for defining the scope of individual project EIS's. Such EIS's are supposed to address issues specific to the project. Information provided in the Generic EIS may, however, help address these issues once they are identified.

The EIS is very definitely intended to aid communities in planning, construction, and management. We hope that their use of this information will avoid the time and cost required for EIS preparation in most small communities.

C.2. Why did EPA do seven EIS's on similar projects instead of doing one case study and then requiring that the other communities' consultants do the necessary work? (Czuprenski)

R.2. The intent behind selecting a number of projects was to ensure a broad perspective on rural lake wastewater management. Projects were selected from locations throughout Region V for this purpose.

We had no idea when the seven individual EIS's were started that the recommended actions would be anything different from what was proposed in previous facilities planning--centralized collection and treatment. In fact, it was not until a substantial amount of field work was completed that the possibility of continuing to use on-site systems was even considered. That six of the original seven projects ended up with the same recommended alternative was the result of the economic and environmental realities of this type of project. If we had foreseen this, we might have skipped the individual projects altogether and proceeded immediately with the Generic EIS.

## Technologies

C.3. Low-flow shower heads are only effective if the residents take showers rather than baths. Facilities planners should not be overly optimistic in estimating potential flow reduciton (Pycha - internal EPA memo not reproduced).

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R.3. For most residents, the greatest benefit of low flow compared to conventional shower heads is in reducing hot water use. Baths require even more water than a shower with a conventional shower head. But if the resident does not care about the cost of heating water, he probably will not switch from baths to showers. Or he may not convert to a low-flow shower head. Education programs or regulations supporting low-flow shower heads in sewered areas may not be effective because the water user may not care about the cost benefit.

The resident with a marginal on-site system has a different perspective. If he does not control water use, his system may back up or have a surface malfunction. Switching to a low-flow shower head and minimizing baths may have the immediate benefit of avoiding sewage problems in addition to reducing water heating costs. In this case the planner might be more optimistic about potential flow reductions.

Section II-A-5-a has been modified to recognize the effect of bath-taking on the flow reduction potential of low-flow shower heads.

C.4. Small-diameter (2- to 6-inch diameter) sewers discussed in Section II.B.2. can be constructed with no minimum grade requirement as long as they are designed for hydraulic carrying capacity. That is, they can have flat sections (no grade) or even uphill sections (negative grade) as long as no house sewers, cleanouts, or manholes overflow at low points along the sewer. (Dix)

R.4. Successful operation of small-diameter sewers designed this way has been reported recently for one location. This design has not been widely tested and, so, would be considered innovative.

C.5. Vacuum sewers have been ignored. (Dix)

R.5. Vacuum sewers are mentioned briefly in Section II-B-2. The EIS does not dwell on off-site collection and treatment methods. Because of the economic advantages inherent in on-site treatment at low housing densities, the EIS concentrates on these technologies. In this context, off-site technologies are addressed because they may be the only safe way to manage wastewater in parts of communities that cannot otherwise benefit from the economies of on-site treatment.

C.6. It is well known that sewage can be treated by aeration; that is, bubbling air through the liquid wastewater. The use of aeration along with evapotranspiration would save billions of dollars in unnecessary sewer costs. (Moore)

R.6. Mechanical aeration oxidizes the organic material in sewage and converts reduced species of chemical compounds to oxidized species. Oxidation also takes place naturally in soil--at a fast rate in unsaturated soil and at slower rates in saturated soil (depending on depth from the soil surface and other factors). On-site and small-scale systems using mechanical aeration are expensive to install and maintain. As a result, mechanical aeration can only be justified where less expensive equipment and natural processes cannot adequately treat the expected sewage flow.

The success of evapotranspiration beds in disposing of wastewater is highly dependent on climate. (We assume that the commentor did not intend to include percolation in his use of the word "evapotranspiration".) Year-round reliance on evapotranspiration beds as the only means of disposal is only feasible in arid and semi-arid climates such as our American Southwest. Within Region V, evapotranspiration beds might be feasible as the sole means of disposal for dwellings used only during summer and early fall. In this case evapotranspiration beds might be chosen over conventional soil absorption systems if soils are impermeable or if effluent discharges to groundwater are not environmentally acceptable.

The use of mechanical aeration before evapotranspiration beds would probably not be justified. Septic tanks provide adequate treatment with this method of disposal.

C.7. Table II-A-1, "On-site Wastewater Management Options for Specific Limitations or Constraints" does not include aerobic treatment units. (Wilson)

R.7. Aerobic treatment units are included in this table as one of several options for sites where subsurface disposal to the soil is not feasible.

Situations might arise where aerobic units would be useful in reducing organic overloads to soil absoprtion systems. However, for most residences organic loads can be reduced more certainly and at much less cost by other means.

C.8. What type of on-site system repairs will abate the effluent plumes detected by septic leachate detectors? (Czuprenski)

R.8. Most of the effluent plumes that have been sampled during preparation of this EIS and the "Seven Lakes EIS's" were adequately treated before emerging into the lakes, and required no action except continuing surveillance.

For those effluent plumes having elevated nutrients or bacteria counts that are not acceptable, several remedies hold promise, such as:

- use of non-phosphate detergents,
- elmination of garbage grinders (reduces organic load to the soil and thus improves phosphorus retention capability of the soil),
- segregation of toilet wastes by use of composting toilets or low-flow toilets used with holding tanks (substantial reduction in organic load, phosphorus, nitrogen and pathogenic organisms),
- effluent plume recovery, discussed in Section II-A-5,
- reuse/recycle and other maximum flow reduction methods (may improve efficiency of septic tanks; will lengthen contact time of effluent with the soil to improve soil treatment),
- replacement of subsurface soil absorption systems with mounds, and
- installation of a pump to dose the existing soil absorption system (ensures better wastewater contact with the soil).

Due partially to the fact that we have only recently had the tools to accurately locate effluent plumes, the extent of effluent treatment provided by existing systems, much less the success of measures listed above, has not been widely assessed. Region V encourages the states, local governments, and consultants to assess this and other modes of on-site system failure, and to experiment with cost-effective ways to remedy them.

C.9. The Minnesota Pollution Control Authority will not allow construction of sub-code systems. (Wegwart)

R.9. This has been a common response to the performance-based decision making that this EIS is recommending. The most frequently expressed reasons for this reponse have been:

1) There are not enough regulatory personnel with the necessary expertise to do the studies or to make the many decisions needed with the performance-based approach.

2) All on-site systems must be designed to treat and dispose of whatever wastewater may be generated in a dwelling.

This EIS's response to this is two-fold.

For decisions to permit systems for new dwellings or other proposed buildings, this EIS supports Minnesota's position. U.S. EPA is funding no facilities for buildings constructed after December 1977, and so has no direct interest in their design. The states are justified in being as conservative as they see fit. This EIS supports reasonable efforts to minimize the risks and consequences (both economic and public health) of future failures.

For design decisions involving existing on-site systems, this EIS also supports reasonable efforts to minimize risks of future failures. This is what the EIS is all about. Where conventional, code-conforming on-site systems are feasible and will minimize these risks, these are preferable to innovative or sub-code system designs. We expect that most on-site upgrades funded by the Construction Grants program will conform to state design codes. However, when states and communities seek to realize the benefits of the Optimum Operation Alternative, they will find, as we have, cases where strict conformance to modern codes will rule out economical and effective design decisions. We believe that providing the necessary personnel to make such decisions and to monitor the effectiveness of the chosen systems will be well worth the cost compared to the holding tanks and off-site systems that might otherwise be constructed. When these cost savings are reflected in lower user charges, it is likely that the communities will agree, even those residents whose use of their system is restricted (see Sections III-E and VI-E-2).

C.10. The Minnesota Pollution Control Authority would not allow construction to commence without knowing if the alternative should be on-site upgrade, group clusters, or conventional sewers. Selections of technologies for individual properties should take place in Step 1, not in Steps 2 or 3. (Wegwart)

R.10. The issue of the level of detail required in a facilities plan proposed action was debated intensively within EPA and with the states in Region V during preparation of the Draft EIS and after publication. Region V's position, stated in the Draft EIS and in Appendix A of the Draft EIS, was that some designation of the facilities to be constructed be made on a site-by-site basis by the end of Step 1. These designations could be tentative and each did not have to be based on on-site inspections.

This issue and the reasoning behind it are now mute. Changes in Federal funding of Step 1 and Step 2 made by the 1981 amendments to the Clean Water Act eliminated the economic benefits to localities of deferring intensive field work until Step 2.

Section II-E-2 has been changed to admit more flexibility in the level of detail for optimum operation alternatives described in final facilities plans. Section II-E-2-a recommends a minimum level that does not require technology designation for specific sites. This is a less specific level of detail than was recommended in the Draft. Section II-E-2-c recognizes the perogative of a state to require a higher level of detail.

C.11. The assumptions behind the Cost Variability Study need to be stated. Vacuum sewers need to be included, and the effect of new design recommendations (based on hydraulic carrying capacity instead of minimum grade) for small-diameter sewers should be explored. (Dix)

R.11. The procedures and assumptions used in the Cost Variability Study will be available when it is published in the near future with the other Technical Reference Documents.

Vacuum sewers were not included in the study because: 1) At the time the scope of the study was defined, cost data were too limited for this technology; and 2) The literature at the time suggested that vacuum sewers would be most appropriate for new buildings and moderately high housing densities, infrequent conditions in the communities that the EIS is concerned with.

As to reanalysis of small-diameter sewer costs, we agree that it would be useful, but we believe that variation in cost resulting from this design revision would be small compared to the variations already analyzed resulting from the several environmental and developmental variables.

C.12. The Cost Variability Study does not state what discount rates have been used to derive the cost comparisons. A sensitivty analysis using different discount rates in computing present worths ought to show that the cost comparisons presented in Chapter II, Section F, can change dramatically according to what discount rate is used. In that the EIS is intended to recommend analyses and methods for the evaluation of alternative wastewater mangement solutions, it is deficient since it lacks any discussion of the effect of the choice of discount rate on the relative merits of projects. (Falcke)

R.12. The discount rate used in the Cost Variability Study was 7-1/8%, the Water Resource Council's recommended rate in early 1980 when the study was prepared. The discount rate used in the study is now reported in the text.

To assess the impact of varying the discount rate, the curves in Figure II-F-1 and II-F-2 representing 50% replacement of on-site systems (Line $E_7$) and construction of new sewers and central treatment plant (Line B) have been recalculated with 2% and 10% discount rates. Figure VII-1 and VII-2 show the effect of discount rates on the curves. The 2% rate favors sewering by lowering the present worth of new sewers and treatment plants while raising the present worth of on-site system replacement. The reverse is true for the 10% discount rate. Overall, the effect of this economic variable is small compared to the effects of the environmental and developmental variables that were the focus of the Cost Variability Study.

In the process of making these new calculations, some errors in the on-site replacement costs were caught and corrected. The net effect of these corrections was to increase the on-site replacement costs. The increase is reflected in Figures II-F-2 and VII-2. The errors were also corrected in Figures II-F-1 and VII-1, but the average cost per house decreases in Figure II-F-1 relative to what was presented in the Draft EIS. This is due to the fact that per house costs in the Draft EIS for on-site replacement were erroneously calculated from initial year houses instead of design year houses as the sewered alternatives were.

Impacts

C.13. The EIS should provide a more in-depth discussion of the public health implications associated with sewage contamination of surface and subsurface waters. (Lisella)

R.13. Potential contamination of recreational and drinking waters is mentioned in numerous places in the EIS, but specific diseases and other public health effects are not detailed. This subject has been discussed in depth in Technical Reference Document, Chapter II-A which will be available in the near future.

COST-EFFECTIVENESS CURVES
Scenario 1
50% Growth

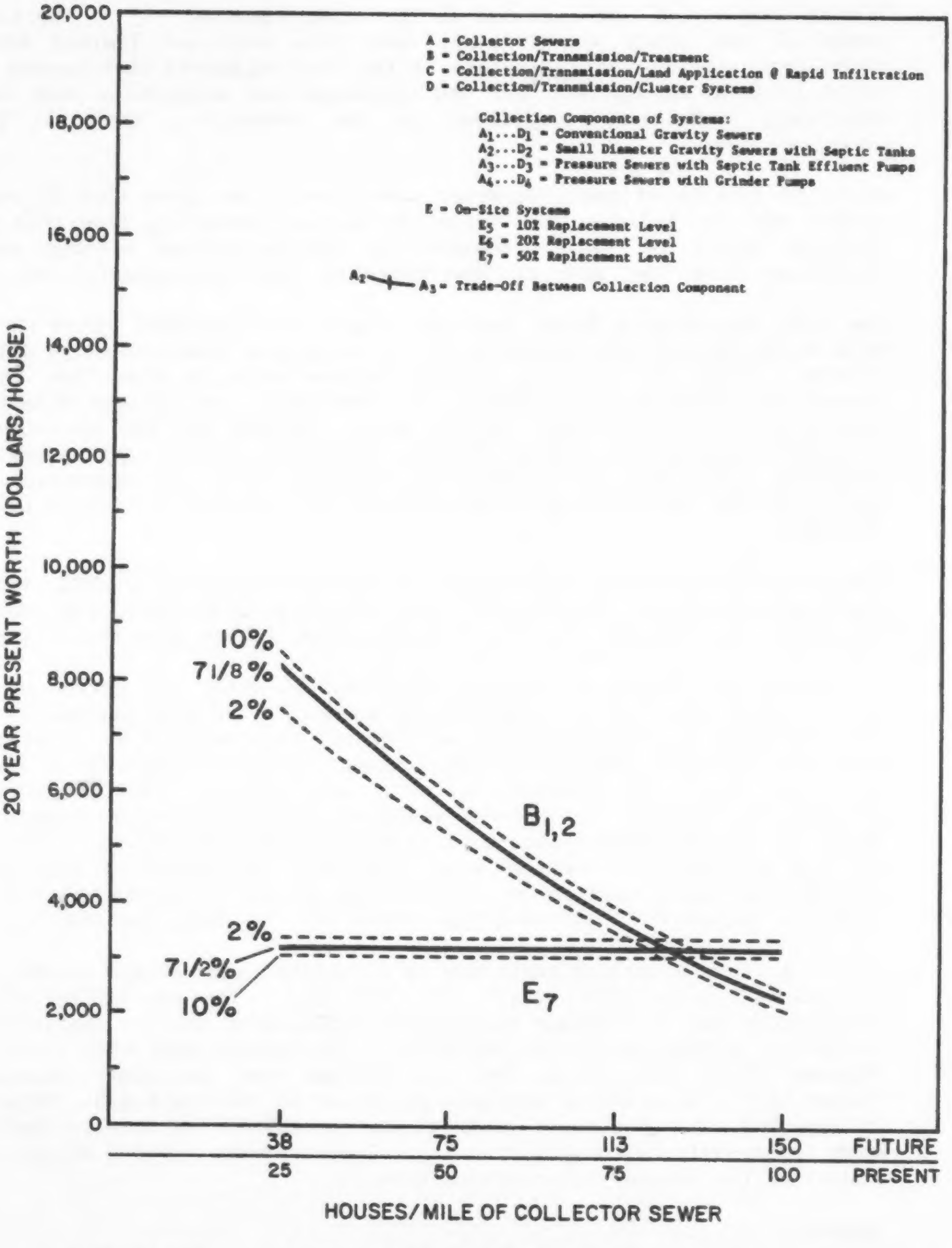

FIGURE VII-1. EFFECT OF VARYING DISCOUNT RATES ON COST-EFFECTIVENESS CURVES FOR ON-SITE SMALL SCALE AND CENTRALIZED TREATMENT ALTERNATIVES FOR SCENARIO 1; 50% GROWTH

COST-EFFECTIVENESS CURVES
Scenario 4
0% Growth

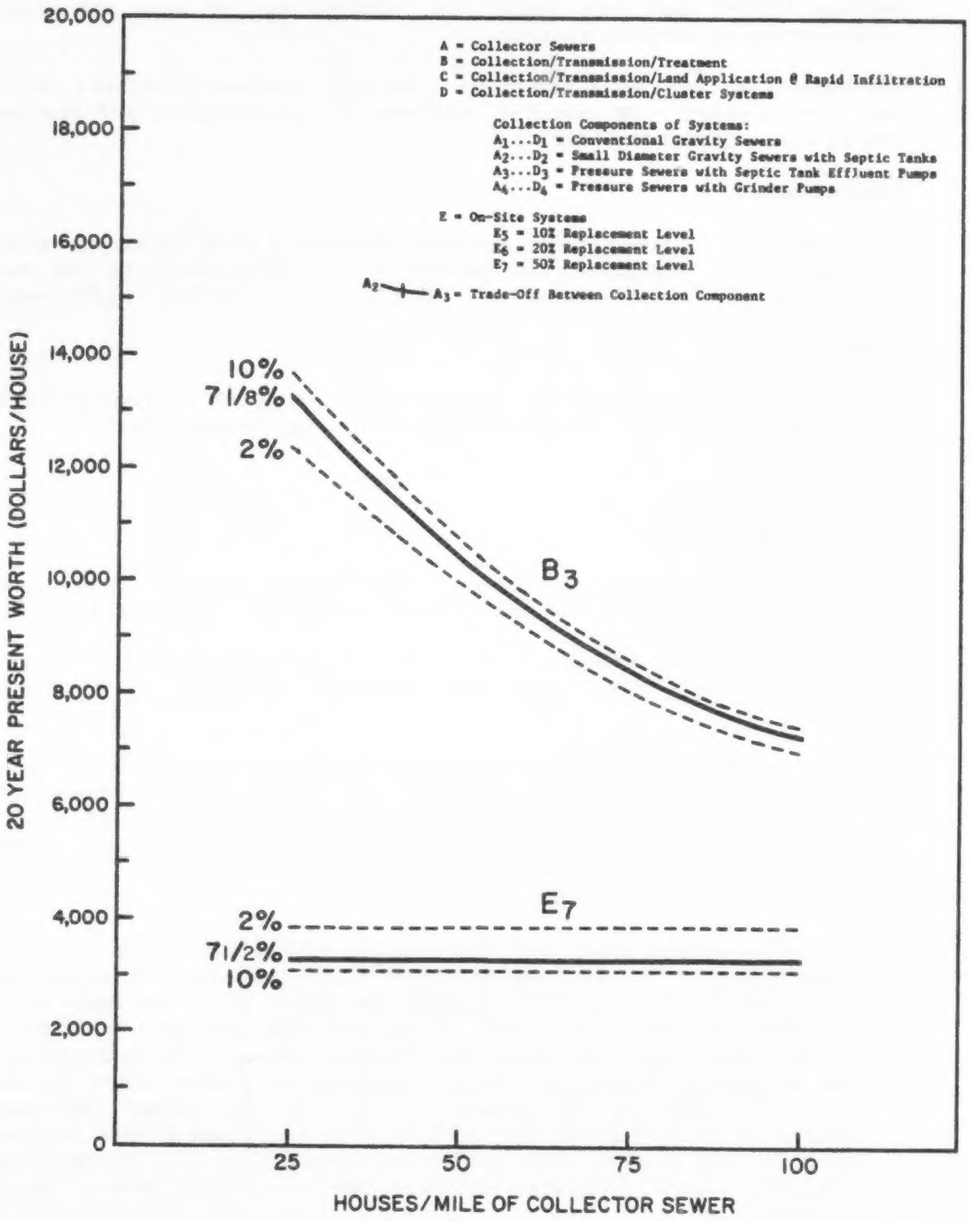

FIGURE VII-2. EFFECT OF VARYING DISCOUNT RATES ON COST-EFFECTIVENESS CURVES FOR ON-SITE SMALL SCALE AND CENTRALIZED TREATMENT ALTERNATIVES FOR SCENARIO 4; 0% GROWTH

C.14. The EIS should address impacts on mineral resources and mineral production. (Huff)

R.14. Section VI-C-6 has been added that address use of sand and gravel for construction of on-site systems.

C.15. Implementation of the alternative treatment systems discussed in the EIS may create other environmental problems if coordination and approval are inadequate. (Druckenmiller)

R.15 Comment noted.

C.16. We would like to see greater program emphasis placed on encouraging local governments to recognize the potential for disturbance to and need for protection of "sensitive areas" identified in the EIS. (Druckenmiller)

R.16. Comment noted.

C.17. Consideration of alternative systems should include a thorough evaluation of the demographic and economic environment. (Druckenmiller)

R.17. Comment noted.

Needs Documentation

C.18. Section II-D-1-c mentions several limitations of the septic leachate detector technique, but not the effects of timing. (Czuprenski)

R.18. Timing is addressed as one of the causes of false negatives: "Seasonal use of dwellings may result in only periodic emergence of leachate at a shoreline."

Obviously, the many facets of the hundreds of subjects discussed in the EIS cannot be explored fully in a document that is required by regulation to be no more than 150 pages. However, since this point is of interest to consultants who will be using the data from septic leachate surveys, we reproduce below a relevant part of our response to a similar comment from the Final EIS for Green Lake, Minnesota:

> "We have learned some very interesting things from both the winter and summer Septic Snooper surveys and related studies at Green and Nest Lakes and in the six other communities where EIS's are being done. For instance, at Otter Tail Lake, Minnesota, EPA performed a winter Snooper survey right after the Green Lake Snooper survey. Because nearly all of the permanent residences showed evidence of plumes under the ice, EPA surveyed again in the summer to see if the summer residents also generated plumes in the lake. There were far fewer plumes in the summer than in the winter. The difference points out the dynamic nature of effluent plumes. It also reflects the results of several interacting factors:
>
> - During snow melt, groundwater inflow to lakes is at its highest rate of the year. This carries effluent plumes into the lake that otherwise may not flow directly to the lake.
> - The direction and rate of groundwater, and therefore plumes, can be altered by the level of a lake. At a high lake level, the groundwater flow will not be as fast and can even be reversed.
> - Seasonal or year-to-year variations in groundwater flow in the nearshore areas can result in the disappearance, then reappearance, of some effluent plumes.

- The strength of a plume that is entering a lake, and therefore its detectability, is strongly determined by mixing with the lake water. EPA has observed plumes during a morning calm that were not detectable when afternoon breezes make waves on the windward shore. During the winter, ice cover reduces mixing, thereby magnifying plumes relative to their summer strength.

"As to the 4- to 6-month duration of plumes, it is now believed that too many variables affect the detectability of effluent plumes to justify use of this estimate. The actual duration period for a given system, or the average for all systems around a lake, may vary substantially from this original estimate. It may well be that we detected only plumes from permanent residences. The pattern of effluent plumes, and the presence of effluent or effluent-like substances in surface runoff remain highly significant and should be used to guide future site analysis."

Additional information on use of Septic Leachate Detectors will be found in Section II-D of the Technical Reference Documents.

C.19. Septic leachate detector studies would have provided more fruitful information if conducted on urban and suburban, unsewered inland lakes, and may have modified some of the documentation of need criteria. (Czuprenski)

R.19. Every new lake we study with this instrument has potential for showing us something not known before. We are also interested in seeing long-term, repeat surveys of individual lakes.

We recognize the possibility that improved understanding of effluent plumes and how they are detected may justify changes in needs documentation criteria.

C.20. The impact statement concludes that preventing nearshore plant growth along open shorelines of a lake is not a sufficient justification for abandoning on-site systems. We do not agree that the localized changes in plant productivity within the main body of lakes will always be so limited. Instead of this generalized statement against abandoning on-site systems, we recommend a preliminary evaluation of each lake to assess the potential for localized productivity impacts. (Wandell)

R.20. What we have called "nearshore plant surveys" were recommended for lake communities as a Phase I needs documentation method in the Draft EIS. Additional emphasis is provided in the Final EIS. Especially when conducted along with a septic leachate survey, a plant survey can indicate the frequency and severity of plant growth problems contributed to by on-site systems. It is recommended that such surveys be supervised by persons who have studied not only the type and spatial distribution of aquatic plant growths but also their habitat and nutrient requirements.

Sections in the EIS that discuss abandoning on-site systems to control nearshore plant growth have been amended to support abandonment of on-site systems where the associated nearshore plant growth impairs beneficial uses of a water body. Alternative means of control should also be investigated. See also R.8.

C.21. The EIS points out the value of Cladophora surveys along shorelines in problem-assessment work. Cladophora surveys techniques should be included in Section II-H-2 discussions of effluent surveys and non-point source monitoring. (Grant)

R.21. Identification of shoreline plant growth during effluent surveys is mentioned in Section II-D-1-f, "Nearshore Plant Surveys." Plant growth can also be located during sanitary surveys, as noted in Section II-D-2-a, "Sanitary Surveys."

On lakes where nearshore plant growth is a local concern, incorporation of plant surveys may be a useful element in ongoing surface water monitoring programs, to which Section III-H-2 is addressed. This is noted in an addition to the section.

C.22. While the phosphorus contributions from septic tank systems to lakes may be small in contrast to other sources, in combination with lawn fertilization and waterfowl feeding they represent the sources which are most controllable at the local level. These problems should be corrected as part of a total lake management program, and should not be minimized in importance in the EIS. (Grant)

R.22. One of the goals of the U.S. EPA and its Construction Grants Program is improvement and preservation of lake water quality. We encourage comprehensive lake management programs. We believe that there would be fewer applications for Construction Grant funds around lakes if there were more comprehensive lake management programs. We therefore have no intention of minimizing in the EIS the importance of effective management programs.

However, the EIS addresses the Construction Grants program as it applies to rural lake and other small communities. The Construction Grants program is limited to funding wastewater facilities. Hence, the document's emphasis is on wastewater management.

C.23. The policy stated in Sections IV-E-3 and VI-A-2-c of the Draft EIS holds that 1) except for unusually severe cases, preventing nearshore plant growths in the main body of a lake is not a sufficient justification for abandoning on-site systems, and 2) abandoning on-site systems adjacent to embayments and canals may be justified if non-point source control measures are implemented prior to or along with the construction of off-site facilities. What constitutes an "unusually severe case," how is the significance of non-point sources going to be determined, and where is the community going to get the funds to implement non-point source control measures? (Czuprenski)

R.23. In our experience of studying the 35 glacial lakes within the "Seven Lakes" EIS study areas, we found no instances where fishing or swimming uses would be impaired on open lakeshores by nearshore plant growth supported in any significant measure by subsurface effluent plumes. The "unusually severe cases" clause accounts for the possibility that there may be exceptional cases where subsurface transport of nutrients does support plant growths that obstruct fishing or swimming.

In contrast, many of the heavily developed embayments and, especially, dredged canals were choked with rooted aquatic plants or were highly turbid from planktonic algae growth. We suspect that non-point sources, surface malfunctions, and subsurface nutrient transport all contribute to those problems. Because, as the commentor suggests, assessing the nutrient loads from each source on such a small scale may be difficult and costly, the EIS recommends eligibility for small-scale collection and treatment in such settings.

As to funding non-point source control, most relevant control measures are in the hands of the lakeshore property owners themselves. Control will be primarily a matter of continuing education about sources of nutrients such as lawn fertilizer, wildlife feeding, pet droppings, lawn clippings, and leaves. Evidence of a community's dedication to continuing education and provisions for periodic nearshore plant surveys may suffice as a non-point source control program.

If inspection of watersheds tributary to embayments and canals reveals other significant non-point sources, the community is expected to take the lead in minimizing them. There are presently no Federal funding sources for non-point source abatement. If funds are required for abatement, they will have to come from state, local, or private sources. If funds are not available from these sources, then the presumed eligibility of off-site facilities for over-productive canals and emabyments will be eliminated, and facilities will be selected without presumption of need for off-site systems.

C.24. The policy on eligibility of collector sewers that correct nearshore plant growth problems seems to be inconsistent with the collector sewer eligibility diagram in Figure II-C-1 and in "Region V Guidance - Site-Specific Needs Determination and Alternative Planning for Unsewered Areas." According to the diagram, nuisance aquatic plant growth should be categorized as either a problem or not; then the density criteria of 10 persons/acre should be used to justify abandonment of on-site systems. (Czuprenski)

R.24. Figure II-C-1 and the Region V Guidance both operate under the assumption that whatever facilities are selected will have a reasonable chance of remedying recognized problems. Therefore, the mere coincidence of nuisance aquatic plant growth and high density development does not justify abandonment of on-site systems--the source of plant nutrients could be a major tributatry, not on-site systems, for instance.

As stated above, the EIS's discussion of on-site system effects on nearshore plant growth is based on our studies of glacial lakes, where we found no aquatic plant growth at nuisance levels on open shorelines that could be attributed to subsurface transport of nutrients. Where we found high levels of plant growth in open lakes, the major nutrient sources did not include on-site systems, so that abandoning them would not improve the plant problem.

C.25. The description of a preliminary lake phosphorus concentration model in Section IV-D-2 is unclear and difficult to follow. Symbols are not consistent and procedures change from the metric to the English system of measurement. (Wandell)

R.25. The discussion has been changed in response to this comment. (The relevant section has been changed to Section IV-E in the Final EIS.) However, the two systems of measurement have been retained. The numerical input to Figure IV-E-1 from Figure IV-E-2 is dimensionless so that the user need only calculate flow through the lake in both metric ($m^3$/s) and English (cfs) units.

C.26. Can the on-site systems/eutrophication model presented in Section IV-D-1 of the Draft EIS be applied to shallow lakes dominated by littoral macrophytes or to kettle lakes with no surface inflow or outflow? (Czuprenski)

R.26. The model was developed to identify lakes that may be sensitive to phosphorus inputs from on-site systems. Those that appear to be sensitive, as indicated by phosphorus concentrations due to on-site systems of greater than .001 mg/L.-P, should have nutrient budgets developed from available data and empirical models and, if shown to be necessary, collection of field data. Where applicability of the EIS model is questionable because of unquantifiable inputs, such as inflow/outflow for kettle lakes, the planner may begin with a nutrient budget instead of the EIS model.

The dominance of macrophytes, on the other hand, is an irrelevant factor in this preliminary step. The EIS model only indicates the level of enrichment due to on-site systems so that an early judgement can be made on the need for more detailed analysis.

C.27. Section IV-D-1 implies that only one fecal coliform sample be taken for any particular effluent plume found along a shoreline. Michigan Department cannot conclusively prove defective sewage systems nor indicate which system is the contributor. More extensive groundwater monitoring or a dye study would be needed to link a contaminated well to a failing septic system. (Wegwart)

R.31. We agree that more extensive analysis would be justified prior to abandoning an on-site system or replacing it so as to protect a well. The more extensive work (beyond well inspection and sampling) would only be justified, however, after a decision is made not to install sewers and, thereby, abandon the on-site system anyway. See EIS Sections II-D-2-b and IV-D-1.

C.32. We are accepting positive tracer dye studies and effluent plumes located during a septic leachate detection survey as direct evidence, not just indirect evidence, as long as the source of the plume can be pinpointed. (Wegwart)

R.32. We have sampled many effluent plumes both in the lakes where they emerge and in the groundwater near shorelines. Most of them were sufficiently treated, showing nutrients and bacteria at or near background levels. Sampling of some identified plumes on a lake is essential to deciding whether they constitute direct evidence. Until sampled, we recommend that plumes located by a septic leachate detector should be considered indirect evidence only.

C.33. MPCA considers holding tanks as direct evidence for evaluation of alternatives, not just indirect evidence. (Wegwart)

R.33. We recommend that strict distinctions be maintained between direct evidence and indirect evidence. The types of direct evidence listed in Region V's guidance are recognized public health or water quality problems--no additional work would be required to establish a need for some sort of remedy. (However, additional on-site tests may be necessary to select the right remedy.) In contrast, indirect evidence indicates potential problems but requires additional sampling or inspection to assess actual performance of on-site systems.

We have classified existing holding tanks as indirect evidence because they are not, of themselves, public health or water quality problems. Holding tanks are often installed, not because a soil absorption system failed without remedy, but because regulations prevented other measures from being tried. They are also installed because property owners insisted on building on lots that should not have been built on. These are not public health or water quality problems; they are management problems.

The reason for making this fine distinction is our concern that planners will look for the causes of the holding tank's presence, assume that it was poor soil, small lot, etc. and then assume that all other similar properties will end up with holding tanks.

We support cost-effective means to reduce reliance on holding tanks. Repeated pumping of the tanks is costly and disruptive. For some properties, frequency of pumping can be reduced by serious flow-reduction measures and/or by allowing separate treatment and disposal of non-toilet wastewater on-site.

C.34. In regard to Section III-B-9 of the Guidance MPCA considers a septic tank discharge to surface waters direct evidence (Wegwart)

R.34. We emphatically agree. Including "systems which feature direct discharge of septic tank effluent to surface water" as indirect evidence was an oversight. It has been corrected.

C.35. Age should not be accepted as indirect evidence, unless systems of a specific age can be correlated to a specific type of installation that is unacceptable. (Wegwart)

R.35. The Guidance recommends correlation of age with performance or excessive maintenance requirements (such as undersized septic tanks) not just with type of installation.

C.36. MPCA sees no value in limiting mailed questionnaires to those cases where very high or very low failure rates are expected. They should be used in all cases. (Wegwart)

R.36. Opinion on this matter is mixed. On the positive side questionnaires can be inexpensive, can be a public participation tool, can be done during the winter when other surveys are not possible, and can highlight parts of a community where later efforts should be focused. On the other hand they tend to be more of an opinion poll than an objective survey, responses are not consistent, and some details required to identify remedies to problems are not obtainable.

We respect MPCA's input on this matter, and have deleted qualified prohibitions to mailed questionnaires in Section II-D-1-d.

C.37. MPCA considers a lot with two types of indirect evidence to be a need situation. Should additional data be collected if a lot exhibits more than one "inferred" evidence? (Wegwart)

R.37. Until a great deal more performance data is collected and correlated to site, design, and usage data, we recommend that indirect evidence not be used in the semi-quantitative manner suggested. Based on the data we have collected, we are wary of creating any new rules of thumb about causal relationships that influence performance.

We believe, however, that defining these causal relationships is feasible. To do so would require compilation and management of the data collected for needs documentation and detailed site analysis. Ultimately, this may support more concrete use of indirect data and result in lower needs documentation costs in the future. See Section II-D-3 of the Generic EIS.

C.38. In regard to terminating needs documentation activities when alternative systems have been shown to be non-cost-effective, the guidance should expand on this to say that this is more applicable in densely developed parts of a municipality and where on-site systems are not viable. (Wegwart)

R.38. The relationship between cost-effectiveness and housing desnity is a central theme of the Generic EIS, and is discussed most directly in Section II-F. We are hesitant to offer generalized criteria for terminating needs documentation in the Region V Guidance for fear that, for instance, planners would assume that the most densely developed part of a community has to be sewered regardless of need, cost-effectiveness, or feasibility of continued use of on-site systems.

C.39. The Region V Guidance states that the goal of needs documentation in Step 1 is to categorize lots into three groups: 1) obvious problems; 2) no problems; and 3) potential problems. The Guidance also recommends community-wide estimates of the type and number of needed on-site facilities based on extrapolations from survey data. MPCA's policy is that all lots will be evaluated, a designation of need or no need will be made for each building, and technology will be selected for each need in Step 1. (Wegwart)

R.30. See reponse to comment 10, above.

C.40. MPCA feels needs should be established and approved before other facility planning tasks are conducted. (Wegwart)

R.40. In theory, the need for a project should be established even before the state puts it on the state priority list. Section II-C-1 briefly discusses the evaluation of U.S. EPA's concern with defining needs. Obviously, this EIS puts great emphasis on needs documentation.

Our analysis of the role of needs documentation in the Construction Grants program has led to consideration of several levels of "need." First, there is the need to start a project at all. A general description of local water quality and public health problems backed up by some specific, if not comprehensive, data should suffice. Facilities planning, including more specific needs documentation work, might be authorized from this level of description. Next, the problems must be quantified and evaluated to an extent necessary to decide whether sewers are "needed" or not. Phase I needs documentation will in most cases provide a sufficient data base for this. Needs must be studied in greater detail (Phase II) in order to estimate costs and management requirements for proposed actions using optimum operation. The need studies get most specific in detailed site analysis for final technology design.

Thus, we concur that sufficient evidence of water quality and public health problems should be submitted before facilities planning is started. The states, of course, have great discretion in saying how much evidence is required. But once facilities planning is begun, needs documentation and other facilities planning tasks should be closely coordinated and can often be done concurrently.

## Grants Administration

C.41. Despite the procedural guidance for needs documentation, alternatives development, and shortcutting the Construction Grants process, the Generic EIS does nothing to shorten or simplify the Grants process for small communities. (Wolfson - informal comment not reproduced here)

R.41. Simplifying the Grants process, while a worthy goal, was not an issue of the individual "Seven Lakes" EIS, the Generic EIS, or the Region V Guidance. However, there has been an evolution of issues in Region V's series of studies that produced these documents. Simplifying the planning and design process is emerging as a key concern now that many of the other issues have been addressed. We have addressed several possibilities for speeding up and simplifying planning and in Technical Reference Document XVI-D. "Alternative Construction Grants Procedures for Small Waste Flow Areas" which has been incorporated in Appendix A along with the Guidance.

Until we have followed several communities through the steps outlined in the Generic EIS, we are hesitant to get more specific about simplified grant requirements.

C.42. The cost-effectiveness analysis charts presented in the Draft EIS (page 57 and 58) indicate that construction of sewers would be suitable only in areas where significant growth is anticipated. Since sewer construction is responsible, to some degree, for enhancing the growth of an area, the conflict between growth and cost-effectiveness goals could be used by reviewing agencies to withhold endorsement of sewers. (Smith)

R.42. There is no conflict between growth and cost-effectiveness. At issue is whether the Construction Grants program will fund sewers where their only advantage over the alternatives is to facilitate growth. The answer is no. This does not preclude communities from seeking other means of subsidizing sewer construction.

C.43. On page 114, an internal EPA memo dealing with access to private wastewater systems is paraphrased to say "that a local or municipal ordinance granting access and control would also be considered equivalent to public ownership." Has the EPA determined in which states such an ordinance is legal? (Wolfson - informal comment not reproduced here)

R.43. No. This in an issue that EPA recognizes to be important. We have offered several suggestions on gaining access in Section F of the EIS, and in more detail in Technical Reference Document VIII-A.

We have studied and reported the benefits and costs of the Optimum Operation Alternative. As expressed in Section I-B-5, it is now time for the states to take the initiative, particularly on issues such as access, to achieve this alternative's potential benefits.

C.44. Section V-A-4-d proposes that substandard on-site systems which 1) are not failing but 2) are similar to systems that are failing, be eligible for replacement. Data collection costs and time to establish similarity would be excessive and possibly greater than the facility construction cost. (Wolfson - informal comment not reproduced here)

R.44. The states and facilities planners will have to exercise judgement in applying this guidance. Until they develop sufficient experience in evaluating existing systems, some on-site testing and inspections may be performed that, in retrospect, will be seen as unnecessary. Until the learning curve is complete, some individual systems may have more time and money spent on detailed site analysis than on construction.

The time and expense can be shortened and the benefits of experience made available to more on-site designers by development of a performance information system, as recommended in the Generic EIS, Section II-D-3.

# LETTERS OF COMMENT TO
# TO THE DRAFT EIS

McNamee, Porter and Seeley

3131 SOUTH STATE STREET · ANN ARBOR, MICHIGAN 48104 · (313) 665-6000

*Consulting Engineers*

ACTIVE PARTNERS
J.M. HOLLAND D.H. HOLAND, JR R.W. FORCE
H.R. VAN EYCK S.C. MARTINBEE R.J. SMIT
R.M. BACHTEAL R.F. BATZER P.C. YOUNGS

RETIRED PARTNERS
R.L. McNAMEE W.S. HERBERT J.C. SEELEY

December 11, 1981

Gene Wojcik, Chief
EIS Section, Water Division
U.S. Environmental Protection Agency
Region V
230 South Dearborn St.
Chicago, Illinois 60604

Re: Draft Generic EIS
Rural Lake Areas

Dear Mr. Wojcik:

The following are comments on the Draft Generic Environmental Impact Statement for Wastewater Management in rural lake areas.

1. The purpose of this document is unclear. Is the intent to completely eliminate future EIS's for rural lake projects, or to act as a guideline and a basis for specific EIS's and aide communities in planning, construction and management? 1
2. If the intent of this document is to act as a guide, it could be a valuable tool not only to those who prepare EIS's, but to those who prepare any planning documents (including 201 facilities plans). If the intent of this generic EIS is to replace future EIS's for rural lake projects, it can only be detrimental to all rural lake areas in question. Each lake and surrounding community have specific characteristics applicable to their own area. These factors may never be discovered and evaluated by the sole use of this generic EIS. Portions of this document could be used beneficially in the preparation of an EIS for a specific area, and great costs could be saved, however a Generic EIS could not effectively replace a specific EIS.
3. As a guidance tool, any alternative to optimization of an existing on-site facility would be more difficult to get approved by the reviewing agencies. Following this guide, optimization of an existing on-site system would almost always be the most cost effective alternative.

4. Assuming the cost effectiveness analysis charts presented in this document are accurate, the only time construction of sewers (gravity or pressure) would be suitable, would be in areas where significant growth is anticipated. Since sewer construction is responsible, to some degree, for enhancing the growth of an area, this conflict could be used by reviewing agencies against an endorcement for sewers. 42

5. The environmental inventory included in an EIS must be as site specific as possible in order to get a true indication of what impacts would be expected from the construction of the proposed action. The Generic EIS would not be site specific. The type of impacts that can be expected are brought out by this document (such as, degradation of water quality, erosion, etc.), however the results could not be quantitative.

Thank you for providing the opportunity to comment.

Very truly yours,

McNAMEE, PORTER AND SEELEY

BY
Raymond J. Smit

RJS:dr

**Johnson & Anderson, Inc.**

Consulting Engineers

2300 Dixie Highway
Pontiac, Michigan 48055
Telephone: 313-334-9901

RECEIVED
'81 DEC 7 PM 12 14
WATER DIVISION

December 3, 1981

Mr. Gene Wojcik, Chief EIS Section
U.S. Environmental Protection Agency - Region V
230 South Dearborn Street
Chicago, Illinois 60604

Re: Draft Generic Environmental Impact Statement for Wastewater Management in Rural Lake Areas

Dear Mr. Wojcik:

Thank you for sending me a copy of the Draft EIS for review. I am currently developing facilities plans for two townships on the suburban fringe of Detroit, specifically in northwestern Oakland County. As the study areas encompass more than two dozen inland lakes, I have found your case studies on "Alternative Wastewater Treatment Systems for Rural Lake Projects" to be very valuable. We have used door-to-door sanitary surveys, wellwater quality sampling, and the septic leachate detection survey techniques in our attempts to document water pollution and public health problems from septic systems per PRM 78-9. I believe that the EPA made their point in the first case study on Crystal Lake that these techniques are required for adequately documenting the need for the project. Therefore, though interesting, I have honestly failed to see why EPA conducted six other (very similar) rural lake EIS's, rather than requiring the communities' consultant to do the necessary work.

Each of the three EIS's that I've seen (Crystal Lake, Otter Tail Lakes, and Nettle Lake) are almost identical in approach, and are identical in recommended actions. The recommendation for "site-specific environmental and engineering analysis of existing on-site systems throughout the proposed service area" has appeared in each EIS. This would seem a better topic for a case study rather than preparing more EIS's providing virtually a repeat of approaches taken in the earlier works. 2
I would especially be interested in knowing the correlation between effluent plume detection by "septic snooping," and the type of repairs able to abate this condition. 8
Also, the application of the abovementioned techniques to urban and suburban unsewered inland lake communities would have provided more fruitful information, and may have modified some of the documentation of need criteria. 19

Other questions I have concern the recurrent themes brought out in the Draft that: (1) except for unusually severe cases, preventing nearshore plant growths in the main body of a lake is not a sufficient justification for abandoning on-site systems, and (2) abandoning on-site systems adjacent to embayments and canals may be justified if non-point source control measures are implemented prior to or along with the construction of off-site facilities. What constitutes an "unusually severe case," how is the significance of non-point sources going to be determined (especially in the case of shallow lakes dominated by macrophytes, which to my knowledge do not lend themselves to current water quality modeling techniques), and where is the 23

community going to get the necessary funds to implement the required
control measures (if for a private lake-not eligible for Section 314
grants)? Furthermore, the above two statements do not appear to be 23
consistent with the "collector sewer eligibility-decision flow diagram"
appearing in the Region V guidance. According to the flow diagram,
nuisance aquatic plant growth should either be categorized as a valid
problem, or not a problem, and the density criteria of 10 persons/acre
used to determine the justification for abandoning on-site systems.
Therefore, if nuisance aquatic vegetation are a problem, either the 10 24
persons/acre criteria should be eliminated (which would be violating
PRM 78-9), or the two themes mentioned above should be revised by
replacing "abandoning" with "upgrading, replacing or abandoning."

With regards to the eutrophication model developed in the Draft
(pp. 102 - 105), is the "water flow through the lake, Q" supposed to
represent inflow or outflow? Note that the areal water load should be
represented by the symbol "q" rather than "Q" when describing the
sequence of calculations (just a typo). Is this model meant to be
applied to shallow lakes dominated by littoral macrophytes, or just to
deep lakes with algal populations? How can it be applied to kettle
lakes with no surface inflow or outflow? This section of the report 26
starts off by stating that abandoning shoreline systems will seldom
result in a change in lakewide trophic status. From my experience this
seems reasonable, however, as the report mentions, systems along
certain portions of a shoreline may produce localized water quality
degradation. For example, total phosphorus concentrations in surface
water samples taken from leachate plumes in two lakes we surveyed all
contained concentrations 2 to 3 times (0.05 - 0.12 mg/l) greater than
background levels. In addition, total-P in groundwater samples at
plume sites were generally elevated over background levels. It was
evident from these analyses that active discharge of phosphorus into
the lakes is occurring from certain shoreline septic systems, generally
from homes on low-lying lots, with dwellings tightly packed, and with
systems located on the lakeside rather than the roadside of homes.
Massive algae blooms and/or weed growths usually accompanied these
local problem areas and often prevented a septic snooper scan along the
entire shoreline. This example again brings out the point of: What
constitutes an "unusually severe case" of nuisance aquatic plant
growth? Can a model reflecting localized degradation be developed to
answer this question, since the model discussed above is really only
valuable for extreme cases?

In the section on bacterial contamination, it is implied that one fecal
coliform sample from leachate plumes during snooping would provide
sufficient data for alternative development and plan selection. Giving
credit to the Michigan DNR for pointing this out in our studies, it
should be noted that the State of Michigan Water Quality Standards
dictate that fecal coliform contamination (for total body contact) 27
shall be determined on the basis of the geometric average of any series
of 5 or more consecutive samples taken over not more than a 30 day
period.

Therefore, septic snooping may indeed be a rapid method for determining locations of problem systems, but a long-term sampling program would be necessary to document a public health hazard from bacterial contamination.

The report mentions several limitations inherent with the septic leachate detection technique. It fails to discuss one of the key items, however, that of proper timing. Weed growths present an obstacle that hinders adequate scanning, so a survey would have to be scheduled for early spring (just after ice out) or late fall (hopefully after weeds expire). However, since cottages aren't occupied in spring, the only time to really obtain an adequate survey along a summer-oriented recreational lake is during a month or two period in late fall. The importance of Construction Grant funding in time for such surveying is thus crucial, or a less than optimal survey would have to be undertaken. 18

Finally, what is a "flowing effluent pipe" as mentioned in the new (undated) Region V guidance as direct evidence demonstrating an obvious problem; and how does the identification of one, in itself, constitute a water quality or public health problem? The only reason I bring this up is because the Region V guidance appearing in the Crystal Lake Final EIS (July, 1980) considered the detection of sewage effluent through "septic snooping" as a criteria for direct evidence, and now this criteria appears as indirect evidence until the effluent is quantified and shown to be a problem. The change seems to be warranted in order to obtain prima facie evidence of water quality or public health problems, but I fail to see how detecting a flowing effluent pipe provides similar evidence. 29

I'm sure that answers to these comments will help me immensely in my facilities planning, and wish to thank you again for allowing me to comment on the report.

Sincerely,

JOHNSON & ANDERSON, INC.

Michael A. Czuprenski

Michael A. Czuprenski, P.E.
Project Manager

MAC:klp

Energy Research Center
EPA Small Wastewater Flows Clearinghouse
(800) 624-8301

Morgantown, West Virginia
26506
(304) 293-4191

West Virginia
University

October 13, 1981

Jack Kratzmeijer
US EPA EIS
5WEE
230 S. Dearborn
Chicago, IL 60604

Dear Jack:

A quick review of the executive summary for the "Draft Generic Environmental Impact Statement for Wastewater Management in Rural Areas" by WAPORA Inc. raised the following concerns with that report.

1. Vacuum sewers have been ignored. These systems have proven
cost effective in areas with high groundwater around water bodies,
or in areas with shallow soils over bedrock. Figures of the
cost per resident vs. density need to be developed. Brian E.
Foreman, Chief Engineer for AIRVAC, should be contacted for 5
information or review of figures from WAPORA. He may be
reached at 219-223-3980.

2. Recommendations for design of small diameter sewers with septic
tank effluent have recently changed. A copy of a paper by
Otis following his experience along with that of Simmons is
enclosed. These recommendations are based on inspection of
an existing system which remained full at all times, having 4
been designed on hydraulic grade lines instead of pipe grades.
These recommendations will have a very significant impact on
the cost of these systems and therefore needs to be evaluated
by WAPORA. Figures for these "effluent sewers" should be
included in the cost effective curves along with the small
diameter sewers. Acceptance of either design may vary from
site to site and the cost of rejecting the "effluent sewers" 11
must be recognized.

3. In general the assumptions for all the cost effectiveness
curves need to be clearly stated. It may be appropriate to
add them in an appendix. Without this information the value
of a curve is significantly diminished. For example on
pressure sewers or vacuum sewers, what is the density of
pumps or valves to residential units? If more than one
unit is served, cost savings are very significant. There are
many other assumptions which may have a significant impact on
cost and therefore must be defined.

Equal Opportunity / Affirmative Action Institution

I would appreciate receiving a copy of the final copy of this report. Could you also please put me on your mailing list for draft and final Environmental Impact Statements. Should you need additional information, please give me a call.

Sincerely,

Stephen P. Dix
Technical Director

SPD/kap

Encl:

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December 12, 1981

Mr. Gene Wojik, Chief EIS Section,
Water Division
US EPA Region 5
230 South Dearborn St.
Chicago, Illinois 60604

Dear Sir:

My comments on the Draft Generic Environmental Impact Statement for Wastewater Management in Rural Lake Areas are as follows:

On-site waste disposal constitutes a sanitary engineering problem. For 100 years it has been known that sewage can be treated by aeration by bubbling air through the liqudd waste water. Organic matter is oxidised and becomes water and carbon dioxide. Yet State Health Departments and County Agencies seem to be preoccupied with code changes, and have not yet, to my knowledge, encouraged the use of aeration which along with evapo-transpiration, would save billions of dollars in unnecessary sewer costs. 6

Sincerely,

Herbert Moore

# The E. J. Wilson Company

2209 E. 10TH ST.
INDIANAPOLIS, IND. 46201
(317) 637-9307

Reply To

P.O. BOX 188
CORDRY LAKE
NINEVEH, INDIANA 46164
(317) 933-2045

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DEC 15 1981

EPA REGION 5
OFFICE OF REGIONAL
ADMINISTRATOR

December 12, 1981

Mr. Valdas V. Adamkus
Acting Regional Administrator
U.S. EPA Region V
230 South Dearborn St.
Chicago, Ill 60604

Subject: Comments on the DRAFT GENERIC ENVIRONMENTAL IMPACT STATEMENT for WASTEWATER MANAGEMENT IN RURAL LAKE AREA.

Page 27 Table II-A-1 Does not included better treatment than a septic, i,e, aerobics that will provide great reduction in BOD, SS and Fe Col plus provide life-supporting oxygen that will help in the soils. 7

Consequently: A system does not require as much sub-surface finger system as for a septic to have the same safety criteria.

Will transpirate through soils deemed too severe or proven unfit for septic effluent.

Comments: Depending upon County records is very inadequate. For example, 28 in Boone County Indiana the Sanitarian testified a few weeks ago in a lawsuit where the homeowners were demanding $90,000.00 for damages, etc. because of a malfunctioning septic system. The Sanitarian presented as evidence their file. Two adjoining homes are similiarly affected, but nothing was reported of them. After a bench trial, the folks were awarded only $4,000.00 which would not recompense them for even a part of their alleged costs -- to say nothing of their non-use and inconvenience.

In another sub-division in Boone County two systems have been re-worked in less than two years. I know of another in the same area that is failing. Boone County does not recognize these as failures.

Cedar Bend sub-division has many failures. No reports, otherwise their would be abatement efforts, woundn't there?

A Lawn & Garden shop in Boone County has been pumping effluent out of an end of a finger onto the ground for 4 years. No record.

Oil, Inc. a new fueling station just off I-65 on 334 has a new septic/mound. Failed from the start. No abatement (naturally, because the state regulatory people designed it by regulation)

In summary, you cannot get good information from regulatory people who are not doing their job (just why would write another page). 28

I am very successful working four sub-divisions around Mores & Geist lakes, which are the Indianapolis Water supply. With over 60 satisfied customers, I must be doing something right. Why don't you see what is being done?

Respectfully,

Edward J Wilson

Edward J. Wilson

Enc: Several newspaper stories

ZIONSVILLE · WHITESTOWN
Sentinel Dispatch
HOMETOWN NEWSPAPER

Wednesday Morning, December 2, 1981

## Judge Awards $4000 In Sewage Suit

Boone County Circuit Court Judge Ron Drury has awarded $4000 to a Zionsville couple in their suit against the R.L. Turner Corporation over damages from a septic tank failure. Anthony (Hank) and Paula Anderson had asked $90,000 for damages and inconveniences resulting from septic failure at their house on Zion Lane east of U.S. 421.

According to Mrs. Anderson, the problem began shortly after their house was built in March of 1977, with toilets backing up and a backyard odor so bad that at times the family was forced to

(Cont'd. on Page 14)

## Judge Awards -

from Page 1

vacate the house and stay either with friends or in a motel because of unsanitary conditions.

Greta Hawvermale, Boone County Sanitarian, gave a deposition stating that the septic tank installation was in accord with county regulations and that an appropriate size tank was used. According to Ms. Hawvermale, "The installation met code and requirements."

Ms. Hawvermale says that the county ordinance has changed and that there is now a state regulation governing the installation of on-site sewage disposal systems. She adds that soil criteria has also changed for such systems, and no on-site systems will be allowed where soils are rated "severe."

Asked if the new legislation should keep such a failure as the Andersons from happening, Ms. Hawvermale said, "I can't give an absolute answer to that, but, generally speaking, the state regulation is a lot stronger than a lot of local ordinances; so theoretically, you shouldn't have this type of problem occuring unless you have abuse by the homeowners."

Mrs. Anderson says that her concern is that such a problem can exist and the system still have met standards. "We feel like we won but we won a losing battle," she says. "Until something is done to make the county realize you just can't say that those are the standards and not follow up to see that they are working properly, then there is a problem."

Judge Drury said that the Andersons were awarded money when the court determined their allegations were true. "The court found that the allegations of the complaint were true and awarded money," said Drury on Tuesday. "They (the Andersons) alleged a faulty septic system and water damage to the home, and that's what they recovered on."

"Thought" provoking comments........

How long is a builder responsible?
Regulations do not assure performance, do they?
Do the regulatory people assume any legal or financial responsibility?
Now..... what do the owners do?
Can they continue to live in the home under described conditions?
Will the County regulations regarding "correction" or "cease & desist" be applied?
What about neighbors and others who have similiar problems? Will they sue?
"Severe" is a relative definition -- it is not "all things to all people"!
How much of your county has "severe" rated soils?
Are they going to stop people from building on their land, if possible?
Why not be more receptive to private industry developed "higher technology"?

Concerned,

Ed Wilson

PS Maybe they should have spent more money and had a Cromaglass Aerobic System.

**The E. J. Wilson Company**

Since 1950

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(317) 933-2045

— THE INDIANAPOLIS STAR —

WEDNESDAY, NOVEMBER 19, 1980.

## Funds for septic tank check

The U.S. Environmental Protection Agency has awarded the Indianapolis Department of Public Works $435,000 to develop a system of locating septic tank failures and studying their solution.

City officials are notified of failures either by the Marion County Health and Hospital Corp. or petitions from citizens wishing to be annexed into the sewer system.

The grant, under the Clean Water Act, will finance the use of aerial infra-red photography to spot potential problems, analyze soil and groundwater data and find environmentally sound and cost-effective methods for disposal of the waste, public works director Richard A. Rippel said.

# The E. J. Wilson Company

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— THE INDIANAPOLIS STAR — FRIDAY, NOVEMBER 14, 1980—

## City given federal grant to study sewer overflows

The Indianapolis Department of Public Works has received a $1.7 million grant from the U.S. Environmental Protection Agency to study sewer flooding problems.

The 18-month survey, required by federal law, will examine the causes of the overflows, their extent, the environmental effects and costs of correcting the problems, said Richard A. Rippel, works department director.

"In the past, the prevailing thinking was that sewer overflows during rainfalls were looked upon as having negligible environmental impact, due to stream dilution," Rippel said.

"However, recent experience indicates that the overflow pollutants may settle in streams, causing pollution problems and health hazards long after the rainfalls have ended," he said.

The extent to which overflow reaches the treatment plants and causes damage there also will be reviewed.

The study will concentrate on the older sections of sewers that handle both floodwaters and wastewaters, but also will include 123 points where overflow is discharged into White River, Fall Creek, Pogue's Run, Eagle Creek and Pleasant Run.

Two firms, Mid-States Engineering and Howard Needles Tammen and Bergendoff, will conduct the study, which will produce a report which may be used as the basis for a federal grant application to correct flooding problems, Rippel said.

BROWN COUNTY DEMOCRAT WEDNESDAY, FEBRUARY 25, 1981

# Utilities threaten apartment plan

The developer of an apartment complex to house elderly residents will be most unhappy if he can not get water and sewer service from the town of Nashville, an architectural consultant said last week.

Architect Steve Miller told town board member Jerry Higgins last Thursday that developer George Monroe needs another statement of intent to provide utility services from the town in order to finalize his loan from the Farmer's Home Administration.

Unless the statement is provided, Miller said, Monroe's project will fall through. Miller estimated that Monroe has already spent $40,000 on the 20-unit apartment complex project.

Miller noted that last May the town board provided Monroe with a letter stating that water service would be provided as soon as the hookup was made between the Nashville and the Brown County water utilities.

At that time, it was estimated the hookup would be completed by summer of 1980 but the hookup still has not been made and the town board doesn't know when it will be completed.

In the same letter the board promised to provide sewer service to the apartment complex.

But now it is uncertain whether that service can be provided.

In the case of another development, Big Tree Subdivision, the State Board of Health has said that no hookons can be made to the system until it is upgraded to handle the amount of sewer passing through the plant south of town.

Utility superintendent Bill Bardes said last week that the town has been producing 320,000 gallons of sewage a day and the plant is only designed to process 250,000 gallons of sewage a day.

Bardes was sure that the State Board of Health would not approve the apartment complex hookup.

Miller maintained that Monroe had proceeded with the project based on the original letter of intent he had received from the town.

If Monroe does not receive utility service Miller predicted he might take legal action against the town.

Miller added that Monroe's request for final plat approval of the project was scheduled to be heard by the Area Plan Commission last night, after The Democrat went to press.

Monroe expected to have no trouble obtaining that final approval, Miller said.

However, if he could not guarantee that utility service would be provided, Miller said the plan commission might not approve Monroe's final plat.

If approval is not obtained, Monroe might not receive the final approval for his loan.

Miller requested that the town board make some determination

THURSDAY, MARCH 26, 1981
94TH YEAR NO. 73 (USPS391-120)

THE NOBLESVILLE DAILY LEDGER

# Officials Will Seek Sources Of Raw Sewage In Sheridan

By LEE LUSE

The State Board of Health will ask the Hamilton County Health Department to run dye tests in the Sheridan area in an effort to eliminate standing raw sewage southwest of the town limits.

Jim Traylor, chief of inspection and investigation for the Water Pollution Division of the state health agency, told The Ledger he would report the results of the department's surprise survey to Hamilton County Sanitarian Norm Gray later this week. Traylor and Carl Brittle, state sanitarian assigned to Hamilton County, inspected the Sheridan sewage disposal plant, the lift station in the west end of town, and a drainage ditch southwest of town on Monday.

Traylor said the disposal plant appears to be working well, although there is some question about the efficiency of the lift station in the west end of town. He also said the waste materials obvious to the eye in the drain, commonly known as Stahl's Ditch, are proof there is a problem.

According to Traylor, Floyd Moore, sewage plant superintendent, assured him the lift station is working as designed. Moore could not be reached this morning for additional comment.

The state board, the county health department and The Ledger have received complaints about the lift station; the most common is that it has not worked at all for long periods of time in the past. There have also been complaints about the odor from Stahl's ditch.

Sheridan's sewage system is a combination system, thought to be sufficient at the time of construction, according to County Sanitarian Norm Gray, who added this type of system is not permitted to be installed today. The drainage ditch, which falls under the jurisdiction of the water pollution division as a tributary to Indiana streams, was intended to handle overflow from the disposal plant. Working correctly there would be a flow only when there was too much water for the disposal plant to handle, and waste would be diluted enough to be unnoticeable.

A homeowner who lives across the highway from the drain said there have been few times in the five years he has owned his property that there has not been standing sewage in the ditch. He said the stench is at times unbearable, especially in the summer. He added he was unaware of the problem when he bought the property.

Board of Health representatives said when the contents of the ditch were observed on Monday there was no flow of water. They said the dye testing will be an attempt to find out if there are homes, inside and outside of town, which have septic tanks directly connected to the storm sewer.

Gray was unsure when the dye testing would start, and did not know how long it would last, saying it might be mid-summer before it was complete, depending on how many homes will be tested. He said in most cases one home is all that can be tested in a week.

Being hooked directly into a storm sewer, intentionally or unintentionally, is a violation of the health code and homeowners found to be in violation will be cited and expected to correct the situation.

Traylor has asked that citizens report situations appearing to violate health codes directly to Sanitarian Carl Brittle, Indiana State Board of Health, Water Pollution Division, 633-0794. He said the board will respond quickly to a request for a survey.

BROWN COUNTY DEMOCRAT WEDNESDAY, JUNE 3, 1981

# Septic-improvement costs anger school board; blame is laid on state

Helmsburg Elementary School
Brown County, Indiana

Specified (based on 7000 GPD)

Use existing 7260 gal septic
Eliminate dosing syphon
1157 gal dosing chamber
2 3 Hp 230-V Weil sewage pumps
60' x 40' above ground sand filter (concrete)
1077 Gal chlorine contact tank
Stick chlorinator
Flow recording meter
Piping to stream to Lake Lemon

Bid: $73,000.00

Extras needed:
+ NPDES permit
+ Certified operator
+ Reports, etc.

Conversations at Board Meeting

Engineer Rep: "The Indiana State Board of Health wrote the specifications!"

Board Member: "Then why are we paying you?"

Conversation at ISBH office

Staff member: "If you use the alternate and have the slightest failure, we will close the school in a day!"

Note: Mr. Ralph Pickard corrected that statement!

+ + + + + + + + +

As another taxpayer, knowing school financial problems -- What do you think?

Complaining bitterly all the way, the Brown County school board last week approved spending what the members believe is about twice as much as necessary to upgrade waste-treatment at Helmsburg Elementary School.

Board members laid the blame for the alleged excess on the state Board of Health.

The state's insistence on a relatively-expensive solution to a pollution problem was termed:

✓"Extortion" by school superintendent John O'Dell,

✓"Blackmail" by board member Rupert Miller, and

✓"Pretty much twisting our arm" by board member Steve Miller.

Septic improvements are scheduled for both Helmsburg and Sprunica as part of expansions at both elementary schools. The school board is under the gun to award a contract if the work is to be completed on time.

Board members said they wished they could choose between a bid covering both projects and totaling $143,765 and a proposed alternative that might cost half that much.

But, the state board of health won't allow the alternative.

The complaints focused on the work at Helmsburg, where no additional plumbing is planned.

Rupert Miller was less eager to argue about the Sprunica work because additional plumbing was planned there.

But why, Miller asked, should the school system pay $73,000 for work at Helmsburg that could be done for $24,000 when the upshot would mean no extra demands on the school's waste-treatment system.

"They (the state) are saying," board member Canden Nelson reasoned, "that we've had a defective system for years" and that it should be fixed.

School business manager Jack Lutes acknowledged the Helmsburg septic system had been using an illegal drain for as long as 12 years.

Nelson granted the weakness of most septic systems in the county.

"In (rainy) weather like we're having now," no systems in the county are working, he said.

Still, O'Dell appeared mystified.

"All you need is a hole in the ground with enough sand filters . . . There truly are simpler systems (than what the state requires)," he said.

Because of the need to make a quick decision, the board voted to bow to the state requirements and approve the more-expensive work. Rupert Miller voted against that position as a protest, although he admitted, "We've done about all we can."

In other business at its meeting last Wednesday night, the school board:

✓Delegated to O'Dell the responsibility for determining when the regular school day hours will be altered Su [illegible] pro-
p

—Greg Temple

Alternate Considered

Edward J. Wilson, P.E. (practical experience) found tank type urinals running 24 hr/day 7days/week 52 weeks/year

Actual water use now: Under 3000 GPD

Bona-fide offer to install:

Use 7260 gal septic tank as comminutor; trash collector; pre-treatment; lift station; equalization tank to spread the 8 hour loading over 24 hours.

Two (2) Cromaglass Aerobic "Batch-Treat" CA-25's (2500 gpd each, or

One (1) Cromaglass CA-50 (5,000 GPD)

6000 sq ft "Proven Performance" aerated sub-surface finger system.

Full two (2) year warranty.

Offer to bond entire system!

Price: $35,000.00

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Call "Mr. Experience" Ed Wilson ac 317 637-9307 2209 E. 10th St., Indpls

ZIONSVILLE - WHITESTOWN

Sentinel Dispatch

HOMETOWN NEWSPAPER

The SENTINEL DISPATCH (USPS 560-850) is
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CABINLAKE, INCORPORATED
Daryl and Susan Dean

EDITOR: Donna Monday
ASSISTANT EDITOR: Joan Lyons

LETTER TO THE EDITOR

# Boone Health Department Warns Of Sewage Problems At Cedar Bend

**Editor's Note: The following letter was sent to Beaty Realtors, which will handle Saturday's Cedar Bend auction by Greta Havermale of the Boone County Health Department.**

It has come to the attention of the Boone County Health Department that you will conduct a sale of lots in the Cedar Bend Sub-Division located in Boone County. This sale is advertised to be on June 13, 1981.

Our department is aware of serious sewage disposal problems in Cedar Bend. We believe that we should advise you of this problem so that you, as the seller, can accurately inform potential buyers of what they might expect.

There is approximately a forty percent failure rate of on-site sewage disposal systems. Basically, the problem is caused by the absence of topsoil on most lots and hard clay just beneath the surface which prevents adequate sewage absorption.

Because of the problems experienced with traditional methods of sewage disposal, we required the owner, Jack Clark, to submit additional data with his permit applications for approval of sewage systems. The details are contained in a letter to Jack Clark dated October 3, 1980, a copy is enclosed.

Copies of correspondence concerning this problem are attached for your edification.

In my opinion, any sub-surface absorption system has limited chance of success at Cedar Bend.

Mr. Jerry March, Boone County Planning Director, met with me to discuss our responsibility and duty relative to this problem. He will submit his position to you in a separate letter which is to be sent with my correspondence.

If you have any questions, please call me at one of the numbers given above.

Very truly yours,
Boone County Health Department
Greta J. Hawvermale,
RPS., Chief Sanitarian

# Residents are doubtful sewage woes will end with new lift station

Alberta Schrock sat and listened for about an hour as the experts did their best to assure her the sewage probably wouldn't continue to back up in her shower and flood the cabin she hasn't been able to rent for three years.

When they were finished, and town board member Bob Piers asked Mrs. Schrock what she thought, she replied:

"I guess I'm from Missouri."

"You mean," replied Piers, "we're going to have to show you?"

Mrs. Schrock nodded.

The Schrocks and other residents of southwestern Nashville have for years lived with the stench and extreme nuisance created by a malfunctioning sewage lift station at the end of Washington Street near Salt Creek.

They believed with the new expansion and improvement of the town sewage system that lift station—and their trouble—would be moved across the creek.

It won't be.

A final revision in the plans calls for the station to be replaced—but not moved.

Steve Williams, representing A&E Engineering, the consultant to the town on the improvement project, outlined for Mrs. Schrock and the town board last Thursday evening how the new lift station would work.

First of all, he said, the new equipment in the station would be much improved over the present equipment and would work much better and more quietly.

Second, since the sewage from the east side of town—including the heavy sources from the motels and the nursing home—would be diverted to a new station behind the Brown County Inn, the Washington Street station would have far less work to do and would run less often.

Third, but not least, moving the station across the creek would cost about $200,000 as compared to the $65,000 cost of replacing the station at its present site.

As Williams proceeded, Mrs. Schrock, speaking for her neighbors, too, questioned his explanations.

Basically, she said she'd heard all he had to say before—years before. And she wasn't about to believe what she heard until she saw it work.

Out of the discussion Thursday grew the suggestion that Williams investigate the cost of installing in the sheriff's office an alarm that would sound if and when the Washington Street station malfunctioned.

Presently, there is only a red light that, when it burns, raises questions about the neighborhood, but is more often than not burned out, Mrs. Schrock said.

Also present for the discussion was Nashville resident Oral Hert, recently retired executive secretary of the state Stream Pollution Control Board.

Hert advanced suggestions and questions, but declined to give an over-all professional opinion of the plans for the town project.

"I've been in administration for 10 years and out of it (technical work) too long," he said.

In an informal discussion with town board president Marge Tissot before the meeting started last Thursday, Hert explained that the state had not cracked down on the malfunctioning of septic systems in the Coffey Hill area east of town because the situation involved only residential systems.

If the state investigated all residential complaints, "They could spend all their time in Indianapolis," he said.

As a practical matter, home problems are left to the county sanitarian to solve, he said.

Hert did observe that 30 to 40 per cent of all septic systems "have problems."

Even "new homes being built (with septic systems) will have problems in three to four years," he said.

Some municipalities have attempted to solve home septic-system problems by taking homeowners to court and having a judge declare their homes unfit for human habitation and order corrections made.

One purpose of last Thursday night's board meeting was to review matters that may arise at the town board's regular monthly meeting on November 2.

It was noted that Carl Brummett had complained about drainage problems caused by damage done to a culvert near the Bean Blossom cemetery when town water lines were being installed.

—Greg Temple

1981-16-81

Mr. Gene Wojcik
Chief, EIS Section, Water Division
U.S. EPA, Region V
2320 South Dearborn St.
Chicago, CA 60604

Attn: 5WEE

Dear Mr. Wojcik,

In response to Mr. Adamkus' solicitation for comments of 1981-09-24, on the Draft Environmental Impact Statement (EIS) for Wastewater Management in Rural Lake Areas, we are submitting the following observations.

(1) The report is intended to serve in a generic way to recommend analyses and methods for the evaluation of alternative wastewater management solutions.

(2) That being so, the report is deficient since it is totally lacking any discussion of the effect of the choice of discount rate on the relative merits of projects.

(3) The report does not even state what discount rates have been used to derive the cost comparisons in Chapter II, Section F. A sensitivity analysis using different discount rates in computing the present worths ought to show that the figures in the Section can change dramatically according to what discount rate is used, thus indicating that the choice of discount rate is an important matter. 12

(4) Nor does the report offer any suggestions as to what discount rate to choose. Appendices C and D use as an example a certain rate but no justification is given for that particular choice.

(5) At a minimum, the report should offer guidelines in the choice of discount rates taking into account that most wastewater management project are financed largely through public funds. Therefore, the discount rate ought to reflect the opportunity cost to the society for undertaking such projects. The weight of credible evidence seems to suggest a real (that is without inflation) discount rate of the order 4 to 5%.

(6) I am attaching a copy of a memorandum from David M. Dornbusch on the matter of discount rates, for your information.

Sincerely,

Caj O. Falcke
Sr. Economist

cc: Larry Silverman

David M. Dornbusch & Company, Inc. 1736 Stockton Street San Francisco, California 94133 (415) 981-3545

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

DEC 2 1 1981

OFFICE OF
WATER

MEMORANDUM

SUBJECT: Discount Rate for Cost-Effectiveness Analysis

FROM: Henry L. Longest II, Director
Office of Water Program Operations (WH-546)

TO: Water Division Directors
Regions I-X

The Water Resources Council published the new discount rate of 7 5/8 percent to cover the period of October 1, 1981 through September 30, 1982. In previous years grantees have been required to use the discount rate published by the Water Resources Council in cost-effectiveness analyses during facilities planning. As proposed, the revised program regulations no longer include this requirement. This will allow grantees to use other discount rates when appropriate.

You should recommend the use of this new discount rate for cost-effectiveness analyses for facility plans starting 30 days after the date of this memorandum. Discount rates applied to facility planning starts during prior fiscal years are:

1978 - 6 5/8 percent (PRM 78-2)
1979 - 6 7/8 percent (PRM 79-4)
1980 - 7 1/8 percent (PRM 80-1)
1981 - 7 3/8 percent (PRM 81-2)
1982 - 7 5/8 percent

A copy of the Federal Register notice published by the Water Resources Council is attached. Copies of this memorandum should be furnished to the States and to new Step 1 grantees.

Attachment

Flows of the Advisory Committee on International Investment, Technology, and Development. The Working Group will meet from 10:00 a.m. to 12:00 noon. The meeting will be held in the Loy Henderson Conference Room of the State Department, 2201 C Street, N.W., Washington, D.C. 20520. The meeting will be open to the public.

The purpose of the meeting will be to review the results of the September 14-17 meeting of the ICCP Working Party, the October 5-6 meeting on Privacy Guidelines Followup, the October 19-21 Special Session on Information Technologies, Productivity and Employment and the October 29-30 meeting of the IBI Working Party on the International Context of Transborder Data Flows. There will also be a discussion of the proposed U.S. comments on the Bing Report on Legal Issues related to Transborder Data Flows, which comments are scheduled for submission to the OECD in early December.

Requests for further information on the meeting should be directed to Philip T. Lincoln, Jr., Department of State, Office of Investment Affairs, Bureau of Economic and Business Affairs, Washington, D.C. 20520. He may be reached by telephone on (area code 202) 632-2728.

Members of the public wishing to attend the meeting must contact Mr. Lincoln's office in order to arrange entrance to the State Department building.

The Chairman of the Working Group will, as time permits, entertain oral comments from members of the public attending the meeting.

Dated: October 9, 1981.

**Philip T. Lincoln, Jr.,**

*Executive Secretary.*

[FR Doc. 81-30711 Filed 10-22-81; 8:45 am]

BILLING CODE 4710-07-M

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## DEPARTMENT OF THE TREASURY

### Fiscal Service

[Dept. Circ. 570, 1981 Rev., Supp. No. 9]

### Surety Companies Acceptable on Federal Bonds

A certificate of authority as an acceptable surety on Federal bonds is hereby issued to the following company under Sections 6 to 13 of Title 6 of the United States Code. An underwriting limitation of $202,000 has been established for the company.

*Name of Company:*

VOYAGER CASUALTY INSURANCE COMPANY

*Business Address:*

P.O. Box 2918
Jacksonville, Florida 32203

*State of Incorporation:*

Florida

Certificates of authority expire on June 30 each year, unless renewed prior to that date or sooner revoked. The certificates are subject to subsequent annual renewal so long as the companies remain qualified (31 CFR, Part 223). A list of qualified companies is published annually as of July 1 in Department Circular 570, with details as to underwriting limitations, areas in which licensed to transact surety business and other information. Federal bond-approving officers should annotate their reference copies of the Treasury Circular 570, 1981 Revision, at page 33975 to reflect this addition. Copies of the circular, when issued, may be obtained from the Audit Staff, Bureau of Government Financial Operations, Department of the Treasury, Washington, D.C. 20226.

Dated: October 16, 1981.

**W. E. Douglas,**

*Commissioner, Bureau of Government Financial Operations.*

[FR Doc. 81-30720 Filed 10-22-81; 8:45 am]

BILLING CODE 4810-35-M

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## WATER RESOURCES COUNCIL

### Principles and Standards for Water and Related Land Resources Planning: Change in Discount Rate

Notice is hereby given in accordance with 18 CFR 711.19 that the interest rate to be used by Federal agencies in the formulation and evaluation of plans for water and related land resources is 7⅝ percent for the period October 1, 1981, through and including September 30, 1982.

The rate has been computed in accordance with 18 CFR 704.39 "Discount Rate" of the Water Resources Council, and is to be used by all Federal agencies in the formulation and evaluation of water and related land resources plans for the purpose of discounting future benefits and computing costs, or otherwise converting benefits and costs to a common time basis.

The Department of the Treasury on October 15, 1981, informed the Water Resources Council pursuant to 18 CFR 704.39(b) that the interest rate would be 12⅛ percent based upon the formula set forth in 704.39(a): "* * * the average yield during the preceding fiscal year on interest bearing marketable securities of the United States which, at the time the computation is made, have terms of 15 years or more remaining to maturity * * *." However, § 704.39(a) further provides "* * * That in no event shall the rate be raised or lowered more than one-quarter of one percent for any year." Since the rate in Fiscal Year 1981 was 7⅜ percent (45 FR 70167), the rate for Fiscal Year 1982 is 7⅝ percent.

Dated: October 15, 1981.

**Gerald D. Seinwill,**

*Acting Director.*

[FR Doc. 81-30722 Filed 10-22-81; 8:45 am]

BILLING CODE 8410-01-M

# MEMORANDUM

# THE CHOICE OF A DISCOUNT RATE FOR EVALUATING WATER RESOURCE PROJECTS

DAVID M. DORNBUSCH & CO., INC.
SAN FRANCISCO, CALIFORNIA

APRIL 81

# THE CHOICE OF A DISCOUNT RATE FOR EVALUATING WATER RESOURCE PROJECTS

The evaluation of a long-term water resource project requires the comparison of capital, operating and maintenance costs with a stream of benefits that will likely occur over a long period of time. Because the costs and benefits accrue at different times throughout the project life, it is necessary to "discount" the streams of costs and benefits to present values that can be compared with one another in a benefit-cost ratio.

The "discounting" is performed using a discount rate that recognizes the time value of money (future dollars having a lower present value than current dollars). The choice of the appropriate discount rate is complicated by inflation. If benefits and costs are projected in terms of prices that rise with inflation, then the discount rate should include an inflation component. However, if the future stream of benefits and costs are expressed in dollars that assume no inflation (constant dollars), then the discount rate should also be one that omits an inflation component. Either method is correct, as long as prices and discount rate are consistent in their inclusion or exclusion of inflation.

As economist Charles W. Howe states:

> ...it is permissible to follow either of the two paths:
>
> 1. Project future benefits and costs in terms of the prices that will exist at the appropriate points in time and take into account the expected rate of inflation. This discounting process should then use a discount factor that includes a component to compensate

> fully for inflation.
>
> 2. Project future benefits and costs in construction period prices and make no upward adjustments for inflation. The discount factor must then not include a component for inflation. General practice is to project benefits and costs in construction period prices and to make a downward adjustment, if required, to the discount factor.[1]
>
> . . .
>
> Thus we conclude that, in the case of general inflation, it makes no difference whether we use (1) benefits and costs all stated in construction period prices and a discount rate containing no inflationary premium, or (2) benefits and costs in the prices of the period in which each is incurred and a discount factor that fully compensates for the rate of inflation.[2]

The approach recommended by the U.S. Water Resources Council is to express all costs and benefits in construction period prices and make no upward adjustment for inflation. As stated by Howe, this requires the use of a "real" discount rate that does not include a component for inflation.

In a 1975 discussion paper, the U.S. Water Resources Council concurs in this approach:

> Characteristics of the Discount Rate
>
> The first characteristic of the discount rate is that it is a "real" rate. The Principles and Standards require an economic evaluation not a financial evaluation of projects. An economic evaluation is the comparison of the "real" benefits and costs of a project.

---

[1] Howe, Charles W.;"Benefit-Cost Analysis for Water System Planning"; Water Resources Monograph 2;American Geophysical Union, Washington, D.C., 1971, p. 55.

[2] Ibid.;p. 81.

> That is, the economic benefits in terms of goods and services received are compared to the economic costs in terms of goods and services required to produce the benefits. This is done by measuring the benefits and costs of projects in constant dollars, e.g., 1975 dollars. Because the effects of inflation (a rise in the general price level) are excluded from the estimates of project benefits and costs, each dollar of costs or benefits represents the same purchasing power regardless of when it occurs. Similarly, the discount rate used to express future benefits or costs as present values should be a real discount (interest) rate, that is a discount rate in terms of goods and services as opposed to money. For this reason, observed market rates of interest -- that is, nominal rates of interest -- are not directly applicable to water resource projects.[3]

A problem arises in the selection of the proper discount rate to use in analyzing the feasibility of a water resource development project. The WRC recommends using a rate that seeks to reflect the cost of long-term Federal borrowing. However, the WRC discussion paper recognizes that this rate is inappropriate in that,

> "the current WRC rate is related to the nominal cost as opposed to the real cost of long-term Federal borrowing."[4]

In the early sixties when the nation's inflation was nearly zero, the recommended discount rate was virtually identical to the real rate and ranged in the neighborhood of 3 percent. However, when inflation increased, the recommended discount rate was allowed to rise, and it is then that it became related to the nominal rate (as opposed to the real rate and real long-term cost of Federal borrowing.) Presently, the WRC rate is somewhere between the real rate and the nominal (fully inflated) rate, since its annual increase has been arbitrarily limited to ½ percent. Therefore, the WRC rate is now inappropriate for either method of analysis described by Howe.

---

[3] "Options for the Discount (Interest) Rate"; Part 4, Planning and Cost Sharing Policy Options for Water and Related Land Programs; U.S. Water Resources Council; Washington, D.C.; November 1975; pp. 4-5.

[4] Ibid, p. 18.

Having established that the appropriate discount rate to use when projecting future costs and benefits in terms of constant dollars is a "real" rate, the next step is to determine what the long-term real rate of interest is. The weight of credible evidence suggests that the long-term real rate of interest is in the range of 2 to 4 percent per annum.

Mr. Paul W. McCracken, Edmund Ezra Day University Professor of Business Administration at the University of Michigan and former Chairman of the Council of Economic Advisors under President Nixon; stated in an editorial in the Wall Street Journal, November 13, 1980:

> "...the true interest rate [is] 2% to 3%..."

Messrs. Dale Jorgenson and Alan Auerbach, Harvard University economists, were cited in Fortune Magazine, March 9, 1981, as follows:

> "Why 4%? Because Jorgenson and Auerbach believe that is the best estimate of the average real return on business equipment." (p. 96)

Messrs. William P. Yohe, Professor of Economics and Director of Graduate Studies in Economics at Duke University, and Dennis S. Karnosky, an economist with the Federal Reserve Bank of St. Louis, presented the results of a study of "Interest Rates and Price Level Changes, 1952 - 1969" in the Federal Reserve Bank of St. Louis Review, December, 1969.

> "Most significant is the finding that price level changes, rather than 'real' rates, account for nearly all the variation in nominal interest rates since 1961." (p. 36)

(In other words, price inflation has accounted for the increase in nominal interest rates).

Yohe and Karnosky used three different statistical methods to calculate the long-term real interest rate between 1961 and 1969, and found that while the nominal rate rose to nearly 8%, the real rate was consistently in the 2 - 4% range for each of the years during the period. (pp. 34-5)

Messrs. Roger G. Ibbotson and Rex A. Sinquefield reported the results of a study of 50 years of real and nominal interest rates in a book called: Stocks, Bonds, Bills, and Inflation: The Past (1926 - 1976) and the Future (1977 - 2000), Financial Analysts Research Foundation, 1977. They show that the average long-term real rate of interest, averaged over the past 50 years, has been:

| | |
|---|---|
| Long term corporate bonds: | 1.8 percent |
| Long term government bond: | 1.1 percent (p. 10) |

Mr. Ranson, partner in H.C. Wainwright & Co. Economics, Boston, writing in the Wall Street Journal, March 16, 1981, states:

> "The real rate of interest does indeed appear to be roughly constant, averaging about 1.75% through 1965 and 2.5% thereafter."

Hence, we conclude that the real interst rate, and therefore, the appropriate discount rate to use in determining the present values of costs and benefits expressed in constant dollars is in the range of 2 to 4% and is certainly not over 4%.

**DEPARTMENT OF HEALTH & HUMAN SERVICES**

Public Health Service

Centers for Disease Control
Atlanta, Georgia 30333
(404) 262-6649

December 9, 1981

Mr. Gene Wojcik
Chief, EIS Section
Water Division
U.S. Environmental Protection Agency
Region V
230 South Dearborn Street
Chicago, Illinois 60604

Dear Mr. Wojcik:

We have reviewed your Draft Generic Environmental Impact Statement (EIS) for Wastewater Management in Rural Lake Areas within Region V. We are responding on behalf of the U.S. Public Health Service and are offering the following comments for your consideration in preparing the Final EIS.

In general, we have no major objections to the development and management of decentralized wastewater treatment in Region V provided such planning practices satisfactorily protect public health and safety. The recommendations in the EIS that define and document project need and water quality impact in unsewered areas will hopefully encourage and enable State and local governments to (1) assess the significance of their water quality and public health problems, (2) optimally operate existing facilities and other low cost alternatives to correct those problems, and (3) recognize those situations in which the optimum operation approach is preferable.

The impact of a wastewater treatment plan and system upon existing and potential vector populations capable of causing vector-borne disease problems or nuisance problems should be considered in determining the acceptability of a given wastewater treatment plan, particularly wetland treatment and pond treatment measures.

We believe the EIS should provide a more indepth discussion of the public health implications associated with sewage contamination of surface and subsurface waters. 13

We appreciate the opportunity to review this Draft Generic EIS. Please send us one copy of the final document when it becomes available.

Sincerely yours,

Frank S. Lisella, Ph.D.
Chief, Environmental Affairs Group
Environmental Health Services Division
Center for Environmental Health

United States Department of the Interior

**OFFICE OF THE SECRETARY**
**NORTH CENTRAL REGION**
**175 WEST JACKSON BOULEVARD**
**CHICAGO, ILLINOIS 60604**

December 16, 1981

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OFFICE OF REGIONAL ADMINISTRATOR

ER 81/2264

Mr. Valdas V. Adamkus
Acting Regional Administrator, Region V
U.S. Environmental Protection Agency
230 South Dearborn Street
Chicago, Illinois 60604

Dear Mr. Adamkus:

The Department of Interior has reviewed the draft-generic environmental statement for Wastewater Management in Rural Lake Areas and has found it to be generally adequate with respect to consideration of resources within our areas of jurisdiction and expertise.

One item which should be addressed is the impact to mineral resources and mineral production. Bureau of Mines data indicate that the principal minerals or mineral products produced in the six-state area include cement, clays, iron ore, lime, magnesium compounds, salt, sand and gravel, and stone. The final report should acknowledge the existence of mines and potential mineral resources within the project area and should define any adverse impacts that the proposed action may have on mineral production. If no ongoing mineral activity or mineral resources will be affected, a statement to that regard should be incorporated into the project. 14

Thank you for the opportunity to comment.

Sincerely yours

Sheila Minor Huff

Sheila Minor Huff
Regional Environmental Officer

**State of Wisconsin** \ **DEPARTMENT OF NATURAL RESOURCES**

*Carroll D. Besadny*
*Secretary*

BOX 7921
MADISON, WISCONSIN 53707

December 22, 1981

File Ref: 1650-2

Mr. Valdas V. Adamkus, Regional Administrator
Environmental Protection Agency
Region V
230 S. Dearborn Street
Chicago, IL 60604

Re: Draft Generic Environmental Impact Statement,
Alternative Waste Treatment Systems for Rural
Lake Projects

Dear Mr. Adamkus:

The Department of Natural Resources has completed its review of the above document.

As identified in this Draft Generic EIS, the use of alternative treatment systems may represent significant cost savings over convential treatment systems for many proposed projects. However, implementation of these alternatives may also create other environmental problems if coordination and approval are inadequate. 15

The purpose of on-site convential or alternative waste treatment systems is to provide levels of waste treatment suitable to protect the environment. To encourage the use of alternative systems is commendable and necessary, but should also include a thorough evaluation of the demographic and economic environment as well. 17

As an additional recommendation, we would like to see greater program emphasis placed on encouraging local governments to recognize the potential for disturbance to and need for protecting "sensitive areas" identified in this document. 16

As in the past, the Department will assist EPA in implementation of this program pursuant to our statutory responsibilities. We hope our comments will prove useful to your agency's development of this Draft Generic EIS.

The Department's Southeast District Office has requested an additional copy of this document. Could you please forward one additional copy for their use. Their address is: Box 13248, Milwaukee, WI 53213.

Sincerely,
Bureau of Environmental Impact

Howard S. Druckenmiller

Howard S. Druckenmiller
Director

cc: District Directors
Bob Steindorf - WW/2
John Cain - WQM/2
Oliver Williams - ILR/4

STATE OF MICHIGAN

WILLIAM G. MILLIKEN, Governor

**DEPARTMENT OF NATURAL RESOURCES**

STEVENS T. MASON BUILDING
BOX 30028
LANSING, MI 48909
HOWARD A. TANNER, Director

**NATURAL RESOURCES COMMISSION**
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CHARLES G. YOUNGLOVE

April 19, 1982

RECEIVED
'82 APR 21 PM 12:05
WATER DIVISION

Mr. Jack Kratzmeyer, Project Monitor
Water Division
U. S. Environmental Protection Agency
230 South Dearborn Street
Chicago, Illinois 60604

Dear Mr. Kratzmeyer:

Staff of the Department's Land Resource Programs Division, Inland Lake Management Unit, has reviewed the Draft-Generic Impact Statement, "Alternative Waste Treatment Systems for Rural Lake Projects," by the U. S. Environmental Protection Agency, Region V. The remarks of this Unit of the Department are limited to those elements of the impact statement dealing with needs assessment of and environmental impacts upon lake ecosystems.

Comments are brief due to the fact that the Division is in basic agreement with the impact statement's assessment of the environmental components, its evaluation of system alternatives, and generally supports the document's conclusions regarding lake ecosystems. Consequently, remarks are limited to the following points:

1. The impact statement on pages viii and ix and at other places presents the conclusion that "preventing nearshore plant growth along open shorelines of a lake is not a sufficient justification for abandoning on-site systems." The impact statement does, however, indicate that this conclusion may not apply for particular, sensitive areas, such as embayments, canals, and small lakes. It is suggested that the open water areas of many large lakes can be similar to the sensitive areas regarding recreational and water quality degradation. Environmental factors, such as shoreline development shape factor, orientation of the long axis of the lake in relation to the prevailing winds, bottom sediment characteristics, etc., can also influence the localized impact of nutrient loading. Consequently, we do not agree that limited changes in plant productivity within the main body 20

of lakes is so universal to justify a generalized statement against abandoning on-site systems. Instead, we would recommend a simple, preliminary evaluation of each lake to assess the potential for localized productivity impacts. This assessment would be very simple and would require very little time. For a minimal cost, it would permit resource managers to be relatively certain they were not overlooking a problem that should be corrected. 20

2. The section on modeling eutrophication (pages 102-105) is unclear and difficult to follow. Symbols employed are not consistent with usual notation used in limnological modeling. For example, "Q" in the impact statement is defined as "water flow through the lake" in m$^3$/sec; it is normally defined as "annual volume rate of water inflow" in m$^3$/yr. Additionally, terms seem to have several definitions. "Q" is defined as water flow through the lake and, also, as inflow/outflow. The procedures also flip-flop back and forth from the metric system to the English system of measurement, i.e., Figure IV-D-1. It is recommended that this section of the report be redrafted with a better definition of terms. It may also help if an example were provided. 25

We thank you for the opportunity of providing comments for the Rural Lakes Projects, Draft-Generic Environmental Impact Statement. If there are any questions regarding these remarks, our staff is available for comment.

Sincerely,

LAND RESOURCE PROGRAMS DIVISION

Howard D Wandell

Howard Wandell, Aquatic Biologist
Inland Lake Management Unit
Land, Lake and Stream Protection Section
Telephone: (517) 373-8000

HW/cs

rpdc

**Northwest Michigan**
**REGIONAL PLANNING AND**
**DEVELOPMENT COMMISSION**

160 East State Street Traverse City, Michigan 49684 (616) 946-5922 Robert C. Morris, Exec. Dir.

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10 December 1981

Mr. Jack Kratzmeyer, Project Monitor
Water Division, USEPA
230 South Dearborn Street
Chicago, Illinois 60604

Dear Mr. Kratzmeyer:

We have reviewed the Draft Generic Environmental Impact Statement for Wastewater Management in Rural Lake Area's and have the following comments.

Over the past several years our Commission has conducted several lake studies using Cladophora as an indicator of phosphorus sources to lakes. Our EPA project officer, Bernie Orenstein, is familiar with our work and has copies of our reports. We have been able to specifically link Cladophora growths with septic system, lawn fertilization, and concentrated waterfowl-feeding problems. We feel the Cladophora survey techniques should be included on page 81 under "Effluent Surveys" or "Nonpoint Source Monitoring" as a problem-identification technique. Your EIS work particularly on Crystal Lake points out its value especially for Step I problem-assessment work. 21

You do discuss Cladophora on pages 105 and 106, but in terms of the algae showing localized phosphorus contributions that you feel will not affect overall lake trophic status, and in terms of the algae itself negatively impacting swimming areas. We can generally agree with the probable minimal effect on trophic status of these phosphorus contributions, but stressing the impact on swimming makes it sound as though the physical presence of Cladophora is really the main problem. The main problem is, of course, not the Cladophora itself, but the phosphorus contribution which causes it. Unfortunately no one knows how much of the phosphorus is used by the Cladophora and how much remains available for use by other forms of plants such as free floating algae. We assume the Cladophora uses only a small amount of the phosphorus entering the lake at that spot. We realize that most nutrient budgets indicate that the total phosphorus from septic systems is relatively small in contrast to other sources, but what happens when you add to the septic problems lawn fertilization and/or concentrated waterfowl-feeding problems which the Cladophora also pinpoint? Although individually all these phosphorus contributions may be small, they do add up, and 22 most important they are often controllable at the local level in contrast to precipitation, dry fallout, and certain nonpoint sources. These problems should be corrected as part of a total lake management program and should not be minimized in importance in the statement although we agree with practical cost considered solutions. 22

We recommend that the discussion on pages 105 and 106 incorporate the point we raise here and also make reference to the discussion on using Cladophora as a survey technique which we recommend you add on page 81.

If you have any questions about these comments please get in touch with me.

Sincerely,

Chuck Grant

Chuck Grant
Water Quality Specialist

/cmt

cc. Bernie Orenstein

Minnesota Pollution Control Agency

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NOV 04 1981

Mr. Jim Novak
U. S. Environmental Protection Agency
Region V
Attention 5 WEE/EIS
230 South Dearborn Street
Chicago, Illinois 60604

Dear Mr. Novak:

Re: Wastewater Treatment Facility/Environmental Impact Statement, Moose Lake - Windemere Sanitary District EPA Project No. C271301-01

We have reviewed the Initial Plan of Study (dated August, 1981) and the Plan of Study (dated September, 1981) for the Moose Lake - Windemere District and would like to offer the following comments regarding the proposed tasks.

1. WAPORA proposes a soil mapping program for the shorelands of the affected lakes in Pine County and to consider the existing data regarding soils in Carlton County as adequate. In order to verify the soils data in Carlton County it would be beneficial to spot check areas with soil testing around the lakes, such as soil borings and perculation tests.

2. The usefulness of a biological evaluation of the littoral areas of Island, Sturgeon, Passenger and Rush Lakes is questionable when considering the large number of variables involved in such a study (i.e. time of season, bottom orientation to sunlight, bottom types, fish communities, etc.). Collection methods for this type of data are likely to be imprecise, and data interpretation may be highly subjective and, therefore, subject to a good deal of error.

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3. The evaluation of swimmer's itch and blue-green algae toxicity does not appear to provide any pertinent data for this study. Swimmer's itch is a common summertime problem in Minnesota and there is no reason to hypothesize the existence of a special relationship between swimmer's itch and the septic tank systems of these lakes. We are not aware of any reported toxic algae blooms occuring in these lakes. In conversations we have had with Philip Economon from the Minnesota Department of Natural Resources, he stated his January 16, 1980 letter, that had raised this issue, was written in a more general context and not specific to problems experienced in the Moose Lake area. We do recommend you contact Philip Economon to expand upon this.

4. The plan of study states the data development for needs documentation will be performed in accordance with the U. S. EPA Region V Guidance on Site Specific Needs Determination and Alternative Planning for Unsewered Area. In previous discussions we have indicated some aspects of the EPA's draft guidance (the one to be used for this EIS) that is in conflict with the MPCA's criteria in this matter. Included is a rather lengthy critique of the EPA's guidance that we hope will be considered in development of Needs Documentation and Alternative Evalution for Moose Lake. If these comments are adequately addressed in the final EIS, the level of documentation required for MPCA approval of a final alternative for Moose Lake should also be adequately provided.

Page 1 I. Objective - EPA - Statement that this procedure "allows for a degree of risk inherent to limited data gathering".

Comment - This seems to be a prelude to EPA usage of limited survey samples.

Page 1 II. Goal - EPA - Statement that the goal of this process is that at the end of process, lots will fall into 3 categories (1) obvious, (2) no problem, (3) potential problems.

Comment - This seems to conflict with MPCA goals of placing lots in either need or no need by the end of this process. We would consider this 3 group concept as goal of phase I of the Needs Survey.

Page 2 III.A.1. - EPA - Surface Failure by remote imagery is direct evidence.

Comment - Remote imagery must be ground truthed as part of the process to be valid. 30

Page 2 III.A.4. - EPA - Contamination of water supply by sewage is direct evidence.

Comment - Presence of these indicators cannot conclusively prove defective sewage systems nor indicate which system is the contributer. Other more extensive ground water monitoring should be included or perhaps an easier and conclusive dye study may be used to link a contaminated well to a failing septic system. 31

Page 2 III.A.5. - EPA - Samples of surface waters.

Comment - This appears to be a septic leachate detection survey, which we also are accepting as direct needs as long as the source of the plume can be pinpointed. 32

Page 2 III.B.2. - EPA - States the water well isolation criteria may be used as area wide evidence.

Comment - Caution should be used if this criteria is used for the whole area. Each lot should be substantiated to have this problem of water well isolation. Also, proximity to wells does not necessarily indicate a problem system.

Page 2 III.B.3. - EPA - Documented g.w. flow from drainfield to well can override adequate separation distance.

Comment - This is not included in MPCA criteria, however, with consideration of distance and soil types this should be acceptable to us.

Page 3 III.B.4. - EPA - Tracer dye show up in surface water considered an inferred evidence.

Comment - MPCA criteria considers positive tracer dye study as direct evidence, provided the source is pinpointed. 32

Page 3 III.B.8. - EPA - Holding tanks considered indirect evidence.

Comment - MPCA considers holding tanks a direct evidence for evaluation of alternatives (holding tanks can be a final solution, however). 33

Page 3 III.B.9. - EPA - Direct discharge of septic tank effluent to surface water is an indirect evidence.

Comment - MPCA would consider a septic tank discharge to surface water a direct evidence. 34

Page 3 III.B.10. - EPA - Age can infer failure if it characterizes excessive failure rates.

Comment - Age in itself should not be accepted. It could be acceptable if the specific age used can be correlated to a specific type of installation and that the installation is unacceptable. 35

Page 3 III. last paragraph - EPA - Predict the type and number of onsite system needed in community.

Comment - This paragraph may be interpreted to make extrapolated estimates from a smaller number of known needs. These estimates into areas of unknown information is not acceptable to MPCA.

Page 4 IV.A.2. - EPA - Should interview local health department tank installers, etc.

Comment - This is not in MPCA criteria but is a very good (and consistent with MPCA attitude) addition.

Page 4 IV.A.7. - EPA - Leachate detection survey for phase 1.

Comment - MPCA states other data gathering is acceptable, which we interpret to include septic snooper. This looks like a good inclusion.

Page 4 IV.A.8. - EPA - Mailed questionaire should be used only in very high problem rates.

Comment - We see no value to this limitation of questionaire use. Questionaires should be used in all cases. They also help as a public relations tool. 36

**Page 5** 1st paragraph - EPA - Inconclusive group consists of lots with indirect evidence of problem.

Comment - MPCA considers 2 indirect evidence a need situation. Should further data gathering be pursued if a lot already exhibits more than one inferred evidence? 37

**Page 5** IV. last paragraph - EPA - Other facilities planning should proceed concurrently with phase 1.

Comment - MPCA feels needs should be established and approved before other facility planning tasks are conducted. 40

**Page 5** IV.B.1. - EPA - Phase II may not be needed if preliminary estimates show conventional sewer more cost effective.

Comment - The EPA guidance does not expand on this as MPCA does to say this is more applicable in highly concentrated areas of a municipality and where on sites are not viable. I think this extra explanation MPCA uses is important. 38

**Page 6** IV.C. 2nd paragraph from bottom - EPA - Field work should be done with idea of site information needed for a onsite alternative to avoid duplication of site visits.

Comment - This is not in MPCA guide but is a very good addition.

**Page 7** IV.C.1. Rep. Sampling - EPA - This is an example for representative sampling.

Comment - This is not included in MPCA criteria but is a good addition to clarify representative sampling.

**Page 8** IV.C.2. Partial Survey - EPA - It is not the intent to identify all problems in community. It is not cost effective to select appropriate tech. for each lot in Step 1. Take a small sample and predict.

Comment - This is totally apposite of MPCA guide lot by lot evaluation and alternative selection. This is the major part of difference between MPCA and EPA policy. 10, 39

Page 8 IV.C.2. Sanitary Survey - EPA - Details of survey.

Comment - These details not in MPCA, but are a good addition.

Page 9 V. 4th paragraph - EPA - Allow sub code installation of new systems lot limitations exists.

Comment - MPCA would not allow sub code (WPC 40) systems to be recommended for installation. 9

Page 9 V. 5th paragraph - EPA - Use a projection for numbers of selected alternative.

Comment - MPCA is against this. We require site by site recommendation.

Page 9 V. 6th paragraph - EPA - Infeasibility of fixing onsite system not justification of central collection.

Comment - This is not explicit in MPCA but good.

Page 9 V. last paragraph - EPA - Community wide cost estimates is adequate for proposed action in Step 1.

Comment - Again, MPCA requires site by site recommendation not area wide estimates.

Page 11 1st paragraph - EPA - Selection of technology is Step 2 or 3 work. Construction can be tandem to analysis.

Comment - This is again, in direct opposition to MPCA criteria of lot by lot alternative selection. We could not allow construction to commence without knowing if the alternative should be onsite upgrade, group clusters or conventional sewers. 10

Page 11 V. last paragraph - EPA - Must develop a management plan before Step 3.

Comment - good addition.

Page 12 VI.D. - EPA - Last statement that site investigation during Step 2 - 3 may change alternative.

Comment - In itself this is acceptable, but it is one more allowance to not finalizing alternative selection until Step 3.

If you have any questions or concerns regarding the above comments please do not hesitate to contact Lawrence S. Zdon at (612) 296-7733 or Michael K. Vennewitz at (612) 296-7375.

Sincerely,

Gordon E. Wegwart

Gordon E. Wegwart, P.E.
Chief, Technical Review Section
Division of Water Quality

GEW/LSZ:jdm

Enclosure - MPCA Needs Criteria

**State of Wisconsin** \ **DEPARTMENT OF NATURAL RESOURCES**

*Carroll D. Besadny*
*Secretary*

BOX 7921
MADISON, WISCONSIN 53707

February 26, 1982

File Ref: 1650-2

RECEIVED
82 MAR 4 AM 11 51

Mr. Valdas K. Adamkus, Regional Administrator
Environmental Protection Agency - Region 5
230 S. Dearborn Street
Chicago, IL 60604

Attention: Gene Wojcik

Re: Draft Generic Environmental Impact Statement, Alternative Waste Treatment Systems for Rural Lake Projects, Supplemental Comments

Dear Mr. Adamkus:

Enclosed are some additional comments on the above documents. These comments were basically developed by the Department's Northwest District office.

## Specific Comments

Page 21, 2.a. Last Sentence - What constitutes a minor impact or an unreasonable cost of abatement?

The Department recognizes the difficulty of developing comprehensive solutions to all situations, however, when a noncomplying system is found, certain measures should be implemented or sought that would at a minimum alleviate these adverse conditions.

Page 22, 2.a. Types of Failures, Third and Fourth Paragraphs - These paragraphs appear to be endorsing a "write-off" of certain groundwaters. The Department recognizes the complexity of this problem; however, as of this letter, there is still a certain amount of emphasis on a non-degradation policy in our agency.

Page 23, Paragraph 5, Fourth Sentence - Aerial surveys may prove useful for general surface malfunction identification but cannot be substituted for accuracy obtained through carefully performed on-site surveys. Aerial surveys should be coordinated with some type of on-site verification program to ensure accuracy.

Page 24, C. Causes of Surface Failures and Plumbing Backups, Second Paragraph - An intensive public education program identifying advantages of maintenance and proper system usage may prove to be the most effective measure in alleviating or preventing surface failures and back-up problems in existing on-site systems.

Page 25, 3. Available Alternative On-Site Options, b. For Existing Systems Not In Compliance With Codes - Perhaps a record keeping system can be developed on a local basis that red flags "sub-standard" systems identified by surveys and investigations. Then, prior to a transfer of ownership (sale of property), a rehabilitation program on these "sub-standard" on-site systems may be implemented to put them into compliance with appropriate codes.

Page 26, c. Use of Soils Data, Third Paragraph, Last Sentence - The Department endorses this concept that "the policies and procedures recommended in this EIS emphasize reliance on empiracal information for decisions on the disposition of existing on-site systems."

Page 35, Table II-B-3. Surface Water Discharge Options for Small Communities - Although the "simple" treatment systems indicated here are effective effluent treatment options, they are also dependent on proper operation and maintenance programs. Since many of these options are energy intensive, their effectiveness is dependent on qualified personnel.

Page 44, d. Mailed Questionnaires - The results obtained by mailed questionnaires are probably only as good as can be verified. A well developed and implemented educational program prior to sending out these questionnaires may pave the way for a cooperative dialog between planners and potentially impacted property owners.

Page 46, 2. Phase II: Data Collection and Comparison, First Paragraph - Are the numbers of sites requiring examination so great that individual surveys of all or most properties are impractical?

Page 47, b. Representative Samplings - The Department agrees that soil mottling is a good indicator of high groundwater elevations.

Page 48, Well Water Contamination, Top of Page - Does the 20% figure assume federal grant assistance eligibility? Will this number provide a representative sample?

Page 48, 3. Retention and Future Analysis of Needs Documentation Data, Second Paragraph - The agency approval system needs enough flexibility so that reviewers can endorse the obvious without having empirical data collected to the "$n^{th}$ degree".

Page 49, Top of Page - The Department agrees with the statement that "as discussed in Section V.C., transferability of needs data would enable state officials to manage information gaps that may include small waste flows, state of the art, costs and management techniques."

Page 49 E. Designing an Optimum Operation Alternative, Fourth Paragraph - The Department agrees with the points presented here that "The purpose of sequencing these efforts is to build decision points into the planning process. If at various points, 'no action' or centralized alternatives are demonstrated to be better than optimum operation, subsequent planning efforts can be redirected as appropriate."

Page 52, C. Proposed Action Description - Regardless of Grant eligibility or participation, a comprehensive program for regulation and inspection of small waste flow systems is needed.

Page 63, G. Shortcutting the Construction Grants Process - Perhaps this section should be moved to an earlier portion of this text to increase its visibility.

Page 68, 2. Community Obligations for Management of Private Wastewater Systems - Local management of these facilities will be instrumental in preventing future environmental degradations. Obligations will need continual emphasis.

Page 75, Top of Page - The Department agrees with the point that "where community management is desirable, the public must be educated about its benefits if the program is to be successful."

Page 75, E. Use of Variances, First Paragraph - The second sentence reads "All states in Region V currently allow construction variances for the new construction of on-site systems where conditions prevent conformity to code." This is a broad statement which should be clarified in order that the reader can interpret what "conditions" are relevant as construction variances.

Page 75, E. Use of Variances, Last Paragraph - While your studies indicate the natural assimilative capacity of soil/groundwater/surface water systems is greater than previously expected, the fact still remains areas are being degraded by improperly operated or installed systems. The overall objective should be to alleviate or eliminate existing problem areas coupled with a process which prevents "new" sources from occurring.

Page 78, Implementing Water Conservation Programs - Water conservation programs will need greater governmental emphasis. It is one of the more obvious beneficial measures in protecting future uses of ground and surface water resources.

Page 89, Facilities Planning Techniques, Top of Page - The Department concurs with the second paragraph that reads "Definition of planning area, assessment of water quality impacts, and calculation of current and future population and land use impacts, are sometimes technically difficult and even controversial subjects. If properly explored, however, they allow realistic assessment of project values and whether it will do more harm than good. Such information is of great value to the project whatever the Federal or State role may be. Indeed it may be of greatest value for the community that must plan and implement a wastewater system using only its own resources."

These are good points that need reemphasis.

Page 90, 2. Identification of Planning Area Where Optimum Operation Alternatives Should be Considered, Third Paragraph - While low population or housing densities may not result in significant public concerns, some type of involvement is needed in order to organize and promote solutions to these scattered problems. Their existence should not be totally ignored.

Page 119, First Paragraph, Last Sentence - The Department agrees that "State policies toward the use of innovative techniques should reflect the trade-offs between risks and economic savings and ensure that the systems do not prove to be future economic liabilitites." Many states, including Wisconsin will need to be dutifully aware of this potential problem.

Page 119, 2. State Planning Activities for Small Communities - Perhaps there should also be a review priority system for projects ready to proceed with their own funding. Unfortunately, review workloads are tied into existing grant priority systems which are in most instances already overloaded. Thus, certain organizations are not being rewarded for their own initiatives.

Page 120, 3. State Grant and Technical Assistance, First Paragraph First Sentence - This sentence states "To overcome some of these problems faced by local communities, a state or regional 208 or similar regional agency could provide management assistance to the local communities."

This concept should be considered for all grant assisted projects not just the smaller scale projects.

Page 122, 4, State Staffing - As with any type of waste treatment system whether on-site or centralized collection facility, their effectiveness is limited to proper operation and maintenance. Future compliance or degradation prevention will be dependent on integrated efforts of all concerned parties (system designers, operators, owners, inspectors, regulators, etc.).

Page 127, b. Future Work Needed - This section on future work needed will require continual emphasis to highlight its importance.

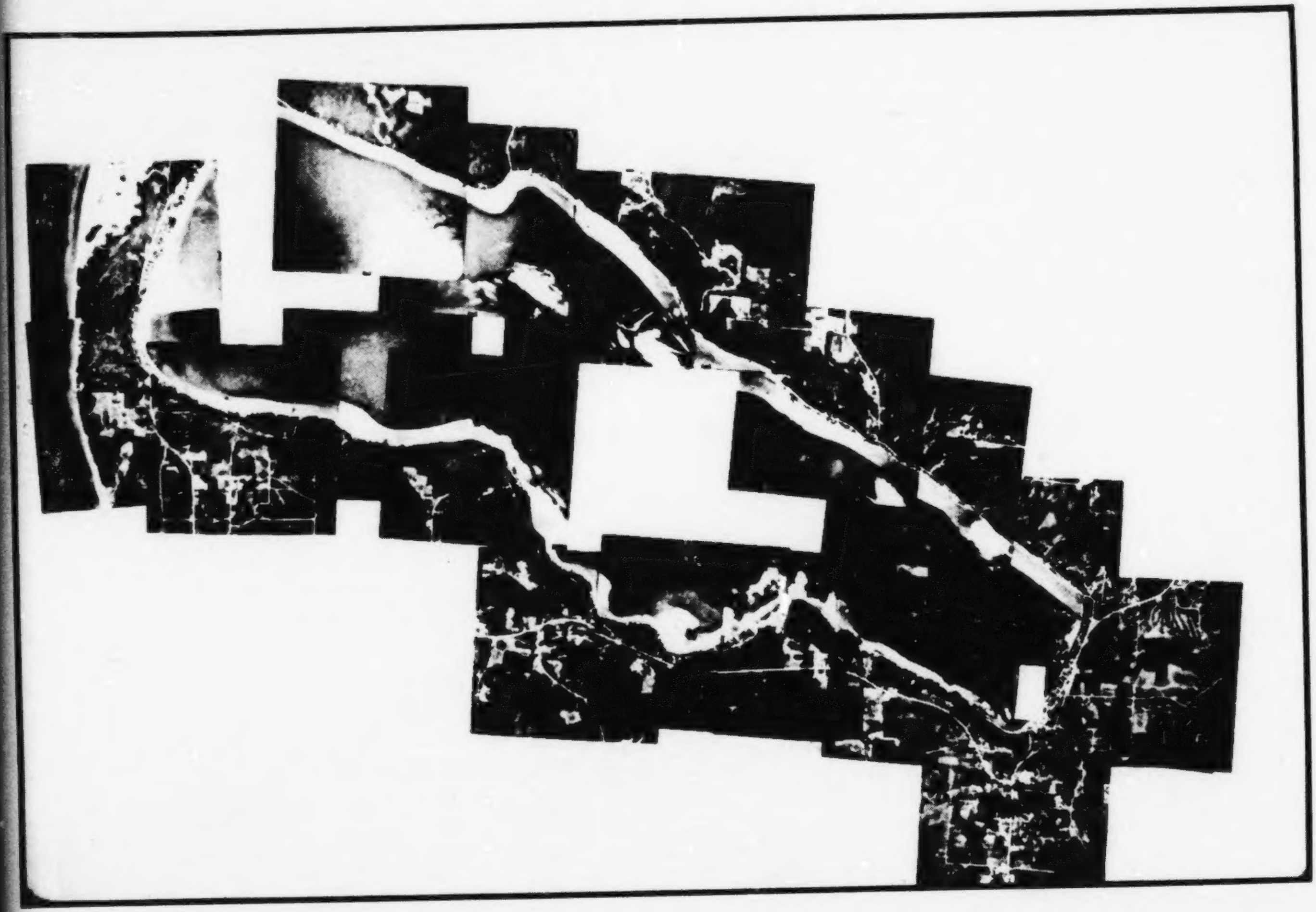
If you have any questions, please contact us.

Sincerely,
Bureau of Environmental Impact

Howard S. Druckenmiller

Howard S. Druckenmiller
Director

# Chapter VIII
# Coordination



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Wisconsin Department of Transportation
Wisconsin Division of Energy
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This Final Environmental Impact Statement was prepared under the supervision of Mr. Jack Kratzmeyer, Project Officer, U.S. Environmental Protection Agency, Region V, Environmental Impact Section and Mr. Alfred Krause, Region V's Small Waste Flows Coordinator. Revisions to the Draft EIS and new material incorporated into the Final EIS were prepared by Mr. Gerald O. Peters, Project Manager for WAPORA, Inc.

The Draft Environmenal Impact Statement was prepared under the supervision of Mr. Theodore Rockwell, Project Officer, U.S. Environmental Protection Agency, Region V, EIS Preparation Section and Mr. Alfred Krause, Technology Section.

The Technical Reference Documents on which this EIS is based and materials for the Draft EIS were prepared by the staff of WAPORA, Inc., Chevy Chase, Maryland. Mr. Gerald Peters, Jr. was WAPORA's Project Manager. Mr. Eric Hediger was WAPORA's Assistant Project Manager. WAPORA's project staff, their areas of expertise and sections of the Draft EIS and Technical Reference Documents for which they were principally responsible are listed below. Four of the Technical Reference Documents were prepared by the Clean Water Fund under the direction of Mr. Larry Silverman.

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# APPENDICES

# APPENDIX A

# EPA REGION V GUIDANCE -
# SITE SPECIFIC NEEDS DETERMINATION and
# ALTERNATIVE PLANNING FOR UNSEWERED AREAS

# REGION V GUIDANCE

# SITE SPECIFIC NEEDS DETERMINATION AND ALTERNATIVE PLANNING FOR UNSEWERED AREAS.

## I. Objective

The objective of this guidance is to clarify fulfillment of the requirements regarding the demonstration of need for sewage treatment associated with the application of Program Requirements Memorandum (PRM) 78-9, "Funding of Sewage Collection System Projects," and PRM 79-8, "Small Wastewater Systems." This guidance is written particularly with respect to the needs of small, rural communities and the consideration of individual on-site and small scale technologies. It suggests procedures which may be utilized to minimize the time, effort, and expense necessary to demonstrate facilities needs. It is also intended to provide guidance pertaining to the selection of decentralization alternatives for a cost-effectiveness comparison. It is intended to prevent indiscriminate definition of need based upon "broad brush" use of a single criterion or on decisions unsupported by fact.

The procedure recommended herein may not be the optimum procedure for all projects. However, compliance with this approach will be prima facie evidence for the acceptability of the "needs" portion of a proposed plan of study. If another method is proposed for documenting needs for wastewater facilities, it is recommended that the grant applicant discuss the proposed approach with reviewing authorities prior to the submission of the Plan of Study and the Step 1 grant application.

This guidance is predicated on the premise that planning expenditures should be commensurate with the cost and risk of implementing feasible alternatives for a specific planning area. The guidance further recognizes the complexity of planning alternative technology. It presents procedures for, and rationally limits, the amount of detailed site investigation necessary to determine the suitability of alternative technology for specific areas within the community, and allows for a degree of risk inherent to limited data gathering.

## II. Goal

The goal of this process is to enable communities to categorize existing on-site treatment systems into three groups. The groups are those experiencing: (a) obvious sewage treatment problems, (b) no problem, and (c) potential problems representing a planning risk that requires resolution by the acquisition of original data.

The acquisition of original data as described will support not only documentation of need but also development of appropriate alternatives and their associated costs.

## III. Criteria for site-specific needs determination

A. Direct evidence that demonstrates obvious problems includes:

1. Failure by surface (breakout) ponding of filter field discharges can be identified through direct observations, mailed questionnaires, and remote imagery.

2. Sewage backup in residences can be identified through respones to mailed questionnaires, knowledge of local septage haulers, or knowledge of local health or zoning officials.

3. Flowing effluent pipes detected by aerial photography, site visits, knowledge of local officials, or results of mailed questionnaires.

4. Contamination of water supply wells (groundwater) by sewage can be demonstrated by well inspection and sampling and analyses for whiteners, chlorides, nitrates, fecal coliform bacteria, or other indicators, and a finding of their presence in concentrations which significantly exceed background levels in groundwaters of the area or primary drinking water quality standards. Improperly constructed wells or wells inadequately protected from surface runoff cannot be used to demonstrate an obvious need. Wells for which construction and protection are unknown cannot be used to demonstrate an obvious need.

5. Samples taken from effluents entering surface water through soil that analysis shows to have unacceptable quantities of nutrients or bacteria.

B. Indirect evidence that indicates potential problems due to site limitations or inadequate design of treatment systems includes:

1. Seasonal or year-round high water table. Seasonal or annual water table can be determined by taking transit sightings from a known lake level, if the dwelling in question is adjacent to a lake or other surface waters. Elsewhere, Soil Conservation Service maps may indicate depth to groundwater.

2. Water well isolation distances (depending on depth of well and presence or absence of impermeable soils). Isolation distances may be addressed in part by lot size. In cases where a community water system is installed or is concurrently planned, this criterion will not be considered. Lots, including consolidated lots, which are less than 10,000 square feet in area, will be assumed to have insufficient isolation distances. However, before this criterion may be used as areawide evidence, a correlation with results of limited representative sampling which substantiate water well contamination must be made.

3. Documented groundwater flow from a filter field toward a water supply well may override seemingly adequate separation distances.

4. Sewage effluent or tracer dye in surface water detected by site visit or various effluent detection systems. Additional tests that indicate unacceptable quantities of nutrients or bacteria in the effluent reaching surface water will establish direct evidence of need.

5. Bedrock proximity (within three feet of filter field pipe) can be assessed by utilizing existing SCS soils maps.

6. Slowly permeable soils with greater than 60 minutes/inch percolation rate.

7. Rapidly permeable soil with less than 0.1 minutes/inch percolation rate. Soil permeability may be assessed by evaluating existing SCS maps.

8. While holding tanks, in certain cases, can be a cost-effective alternative, for purposes of site-specific needs determination, a residence equipped with a holding tank for domestic sewage should be considered as indirect evidence of need for sewage treatment facilities. Location of holding tanks will be identified through records of local permitting officials, septage haulers, or results of mailed questionnaires.

9. On-site treatment systems which do not conform to accepted practices or current sanitary codes may be documented by owners, installers, or local permitting officials. This category would include cesspools, inadequately sized system components (the proverbial "55 gallon drum" septic tank), and systems which feature direct discharge of septic tank effluent to surface water.

10. On-site systems: (a) incorporating components, (b) installed on individual lots, or (c) of an age, that local data indicate are characterized by excessive defect and failure rates, or non-cost-effective maintenance requirements.

Indirect evidence may not be used alone to document the need for either centralized or decentralized facilities. Prior to field investigation, indirect evidence should be used to define the scope and level of effort of the investigations. When the investigations are finalized, indirect evidence and results of the field work can be used together to predict the type and number of on-site and small scale facilities needed in the community. Facilities predictions form the basis for alternatives development in Step 1 facilities planning.

## IV. Needs determination for unsewered communities

For projects in which the scope of work is difficult to assess during the Step 1 application, it is recommended that Step 1 be divided into two phases to more effectively allow estimation of the planning scope and associated costs. Phase I will consist of a review of existing or easily obtainable data. Phase II will include on-site investigations and representative sampling necessary to adequately define water quality and public health problems, identify causes of the problems and predict measures that remedy the problems. Phase II will also include development of alternatives and completion of the facilities plans. Both phases should be addressed in the Plan of Study and grant application. The phases are discussed in greater detail below.

A. Phase I

The review of existing or easily obtainable data may include the following as appropriate:

1. Review of local well and septic tank permit records. Repair permits for septic tank systems can provide valuable data on rates and causes of system failures as well as information on the repairability of local systems.
2. Interviews with health department or other officials responsible for existing systems, with septic tank installers and haulers, and with well drillers.
3. Review of soils maps
4. Calculation of lot sizes
5. Estimate depth to water table by reference to lake levels or from information in soil maps.
6. Aerial photography interpreted to identify suspected surface malfunctions
7. Leachate detection surveys of ground or surface water
8. A mailed questionnaire regarding each owner's or resident's knowledge of the on-site system and its performance. Mailed questionnaires will generate useful data only if well prepared. Generally, mailed questionnaires should be used only where available information indicate very low problem rates (to support No Action alternatives) or where the data indicate very high problem rates (to support central collection and treatment alternatives).

This preliminary data will be used to categorize developed lots within the planning area into one of three groups:

1. Obvious-problem
2. No-problem
3. Inconclusive

The"obvious-problem" group consists of those lots where at least one criterion of direct evidence of a need (specified on Page 2 of this guidance) is satisfied.

The "no-problem" group consists of theose lots where there is no direct or indirect evidence to indicate that the present system is inadequate or malfunctioning.

The "inconclusive" group consist of developed lots with indirect evidence of problems. The size of this group and the types of indirect evidence associated with it will dictate the scope and level of effort of field investigations conducted during Phase II.

Typically field work in Phase I will be limited to rapid, community-wide surveys which require little or no entry onto private property. Examples are acquisition and interpretation of aerial photography, field checking of aerial photography interpretations, and shoreline effluent scans. Additionally, a windshield survey of the community in the company of health department officials, soil scientists or other locally knowledgeable persons will help the applicants' representative or consultant develop a strategy and cost estimate for Phase II field investigations.

To facilitate communication of Phase I information, preparation of a planning area base map at a scale sufficient to locate individual buildings will normally be helpful. U.S. Geological survey 7.5 minute maps (1:24,000) Soil Conservation Service soil maps (1:15,840) or local tax maps can be used to inexpensively prepare base maps. At the end of Phase I, base maps can be used to show developed areas obviously requiring centralized facilities, individual buildings with obvious problems and developed areas with indirect evidence of problems.

Phase I as used here applies principally to needs documentation activi ties. Obviously, other facilities planning tasks can proceed concurrently with Phase I.

B. Mid-Course Review

At the end of Phase I, the results of the Phase I effort should be presented for review and concurrence before proceeding to Phase II. The Mid-Course Meeting facilities plan review is an appropriate time for the presentation and discussion of the Phase I results.

The following should be considered at the Mid-Course Meeting:

1. It may become apparent during Phase I that on-site, alternative technology systems will not be cost-effective for segments of the community that have obvious needs. In this case, a preliminary cost estimate for conventional collection and treatment should be compared to that for the innovative/alternative treatment solution. If cost estimates and technical analysis indicate that the use of alternative technology is clearly not cost-effective, needs documentation may be terminated for these segments without proceeding to the on-site investigations of Phase II.

2. The number of lots to be investiaged during the on-site evaluation should be reasonably estimated. If the original estimation of on-site work included in the Step 1 Grant Agreement is found to be in error at the end of the preliminary evaluation (Phase I), a request to amend the grant amount, if necessary, may be

submitted and a grant amendment expeditiously processed provided there is concurrence at the Mid-Course Meeting.

## C. Phase II Work

Field investigations in Phase II have two primary purposes:

- reclassification of buildings from the "inconclusive" category to "obvious problem", "no problem" or "potential problem" categories (defined below)
- development of information needed to predict the technologies and their costs for responding to the community's waste water problems.

Field investigations can also be designed to accomplish other objectives such as public participation, socio-economic data collection, etc.

During Phase II previously unrecognised but documentable water quality and public health problems may be identified, increasing the number of "obvious problem" buildings. The remainder of buildings investigated will be classified in the two remaining categories. In order to do this, representative sampling of site conditions and water quality in conjunction with partial santiary surveys may be conducted. Both "obvious" and "inconclusive" problem buildings should be included in the partial sanitary survey so that reasonable correlations between site conditions, system usage and system failures in the community can be made.

"Potential problems" are systems which do not yet exhibit direct evidence of failure but which can reasonably be expected to fail in the future. Justifying this expectation must rely on analysis of the causes for failure of substantially similar systems in the community. Similarity will be judged on informaton for system usage (number of occupants and types of sanitary appliances), system design and age, and verified site limitations (permeability, depth to groundwater or bedrock, slope, surface drainage, etc.). Buildings in the "inclusive" category whose systems are not similar to any documented failing system will be included in the "No Problem" category.

This work should be proposed and conducted with the knowledge that adoption of decentralized alternatives will necessitate complete site analysis for each building later in the Construction Grants process. Work should, therefore, be thorough enough that augmentation of the Phase II work by later studies can be accomplished without duplicating the Phase II work. The work should also seek the causes of problem, not just their existence, so that typical on-site and small scale technologies can be tentatively identified and incorporated into community alternatives.

Representative sampling of site conditions and water quality should be carefully coordinated with partial sanitary surveys. While the design of this work will obviously have to be tailored to each community's unique situation, general guidance is provided here.

1. Representative Sampling

   a. Seasonal or permanent high water table. Soil surveys and comparison with known lake levels reviewed in Phase I may not be accurate enough to explain specific on-site system problems or to carefully delineate groups of lots where high water table is a serious site limitation. Soil to a depth of 5 or 6 feet on or adjacent to suspect lots can resolve such uncertainties. Where seasonal high water table is suspected and work has to be conducted during dry weather, a soil scientist with knowledge of local soils should be involved.

   b. Groundwater Flow. The safety of on-site well water supplies and springs on small lots may depend on the rate and direction of groundwater flow. Estimating the effects of effluents on surface waters may also require such information. Methods which indicate groundwater flow characteristics should be selected and supervised by qualified professionals. Generally this work in Phase II will be limited to evaluation of well logs and other available data and of rapid surveys in special areas such as lakeshores. Exceptions for more intensive work will be considered where uncertainties about sources of well contamination need to be resolved for specific lots or groups of lots.

   c. Well water contamination. Where lot sizes are small or soils are especially permeable, collection and analysis of well water samples at residences included in sanitary surveys should be considered. Parameters that can be evaluated as pollution indicators include, but are not limited to: chlorides, nitrates, phosphates, fecal coliforms, surfactants, whiteners and other readily detectable constituents inherent to domestic waste water. No well samples should be collected from wells that are improperly protected from surface runoff or other non-wastewater sources. An inspection report should accompany each well analysis.

   d. Shallow groundwater contamination. In areas with drainfield to groundwater separation distances less than state standards, shallow groundwater at or near affected water bodies (lake, stream, unconfined aquifers) should be sampled before abandoning on-site wastewater systems on the basis of high water tables. Discrete samples may be collected during checks of high water tables for analysis of conventional parameters as listed above. Alternatively, as rapid survey techniques are perfected, they may be more appropriate.

   e. Soil permeability. If very slow or very rapid soil permeability is suspected of contributing to surface malfunctions, backups or groundwater contamination, soil characteristics can be evaluated by augering to 5 or 6 foot depth on or adjacent to selected lots. Usually, descriptions of soil horizons by depth, color, texture and presence of mottling, water or bedrock will suffice. Percolation tests for existing systems will be necessary only in extraordinary circumstances.

2. Partial Sanitary Surveys

It is not the intent of needs documentation to finally identify each and every wastewater problem in a community. It is not cost-effective to select appropriate technologies for each property in Step 1.

Therefore, Phase II sanitary surveys will include only a sufficient number of existing buildings to confirm the level and type of need present, and to predict the type and approximate number of measures to correct the problems. Correlation of partial sanitary survey data, representative sampling, and indirect evidence of system problems should be sufficient to meet these objectives.

Sanitary surveys should include for each building:

- an interview with the resident to determine age of the building and sewage disposal system, design and location of the sewage disposal system, system maintenance, occupancy of the building, water using appliances, use of water conservation devices, and problems with the wastewater system.
- an inspection of the property, preferably in the company of the resident, noting location of well, septic tank, soil absorption system, pit privies and other sanitary facilities; lot dimensions; slope; roof and surface drainage; evidence of past and present malfunctions; and other relevant information such as a algae growth in shoreline areas.
- any representative sampling that is appropriate to the site and that can be scheduled concurrently.
- preliminary conclusions on maintenance, repairs, applicable water conservation methods, and types and location of replacement or upgrading for existing wastewater systems.

As a rule of thumb, the number of buildings surveyed should not exceed 30 percent. Where Phase I data is very incomplete, the buildings may be selected on a random basis and should include a minimum of 20 percent of existing buildings. Where buildings with obvious problems and areas with indirect evidence of problems are well delineated in Phase I, the surveys can be better focused, perhaps requiring fewer buildings to be surveyed. From 10 to 50 percent of buildings having obvious problems should be surveyed. In areas with indirect evidence of problems, 20 to 30 percent would be sufficient. Areas with neither direct nor indirect evidence may be surveyed where system age, unusual occupancy patterns or especially severe consequences of system failure so indicate.

## V. Planning of Alternatives

In unsewered, low housing density areas, PRM 78-9, "Funding of Sewage Collection System Projects", puts the burden of proof for need and cost-effectiveness of sewers on the applicant. The four criteria outlined in PRM 78-9 for eligibility of collector sewers are:

- need
- cost-effectiveness
- substantial human habitation in 1972
- 2/3 rule

Figure 1 portrays the relationship of these criteria in a decision flow diagram.

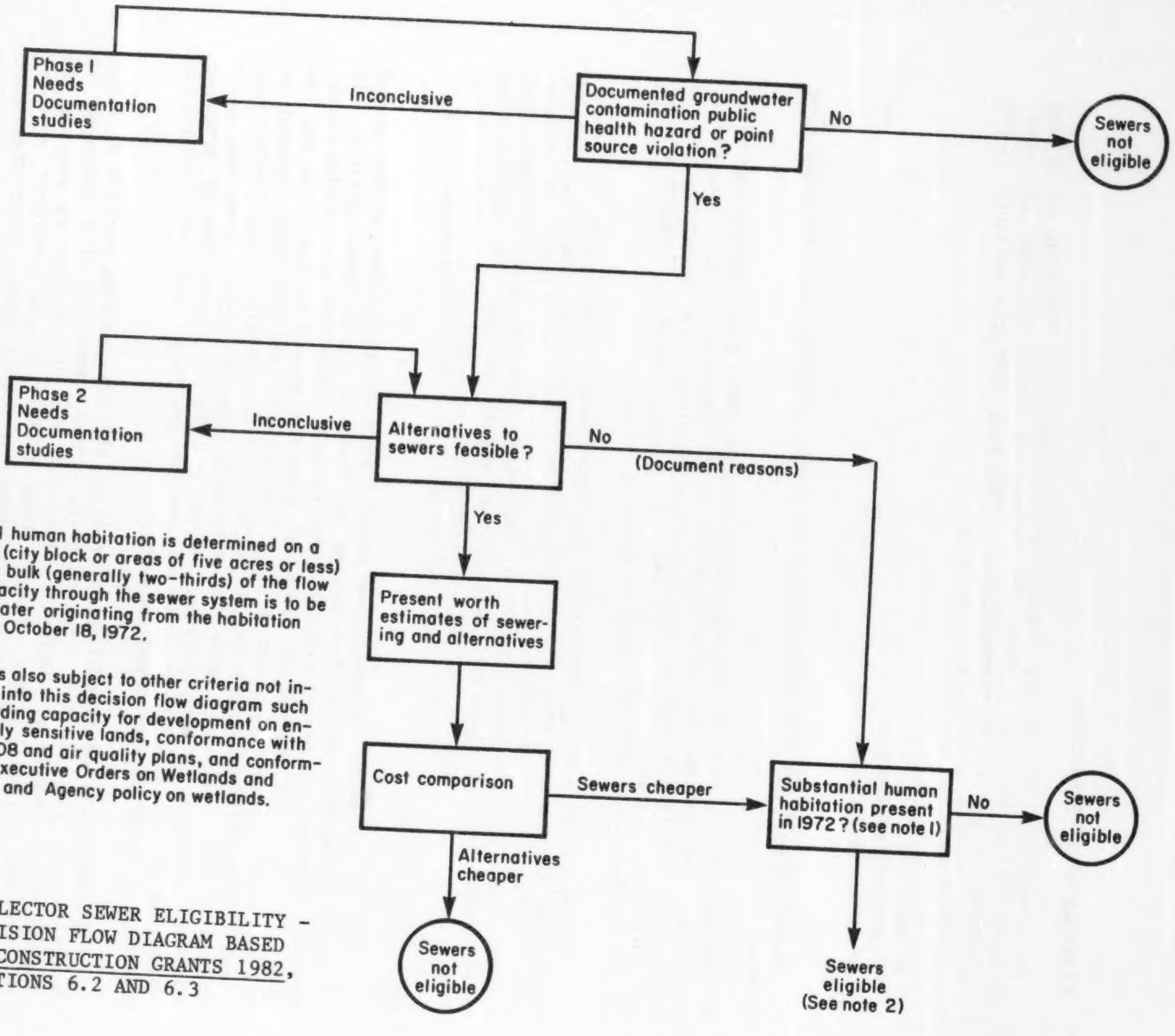
Definition of need by the approach outlined above will address the first criterion. Estimating cost-effectiveness will typically require two steps: determining the feasibility of non-sewered technologies for remedying obvious and potential problems, and comparing the present worth of feasible non-sewered technologies with the present worth of sewers.

The determination of feasibility for non-sewered technologies should not be limited to standard septic tank/soil absorption systems. Where lot sites, site limitations or excessive flows can be overcome by alternative technologies, these must be considered. To the extent that the needs documentation results show that existing soil absorption systems smaller than current code requirements can operate satisfactorily sub-code replacements for obvious problems should also be considered if lot site or other restrictions preclude full sized systems.

The use of needs documentation results in developing alternatives should be guided by methods selected to design the Phase II field investigations. If sanitary surveys and representative sampling were conducted on a random basis, then the types and numbers of technical remedies should be projected for the entire area surveyed without bias. However, if efforts were focused on identified problem or inconclusive segments of a community, then predictions from the data should be made for surveyed segments only. Real but unrecognized problems in "no problem" areas can be accounted for by assuming upgrading or replacement of existing systems in these areas at frequencies reasonably lower than surveyed segments.

Infeasibility of remedying individual, obvious problems on-site will not be sufficient justification for proposing central sewering of a community or segment of a community. Off-site treatment can be achieved by pumping and hauling and by small scale, neighborhood collection and treatment systems. The choice between these approaches should be based upon a cost comparison which includes serious flow reduction measures in conjunction with any holding tanks.

Segment by segment cost-effectiveness comparisons will be required only for those segments where new facilities for off-site treatment are proposed. Community-wide cost estimates for upgrading or replacement of on-site systems in decentralized areas will generally be adequate for description of Proposed Actions pending detailed site analysis and cost estimates for each building in Step 2.


Phase 1
Needs
Documentation
studies
Inconclusive
Documented groundwater contamination public health hazard or point source violation?
No
Sewers not eligible
Yes
Phase 2
Needs
Documentation
studies
Inconclusive
Alternatives to sewers feasible?
No
(Document reasons)
Yes
Present worth estimates of sewering and alternatives
Cost comparison
Sewers cheaper
Alternatives cheaper
Sewers not eligible
Substantial human habitation present in 1972? (see note 1)
No
Sewers not eligible
Sewers eligible (See note 2)

Note 1: Substantial human habitation is determined on a small tract (city block or areas of five acres or less) basis. The bulk (generally two-thirds) of the flow design capacity through the sewer system is to be for wastewater originating from the habitation existing on October 18, 1972.

Note 2: Eligibility is also subject to other criteria not incorporated into this decision flow diagram such as not affording capacity for development on environmentally sensitive lands, conformance with approved 208 and air quality plans, and conformance with Executive Orders on Wetlands and Floodplains and Agency policy on wetlands.

FIGURE 1. COLLECTOR SEWER ELIGIBILITY - DECISION FLOW DIAGRAM BASED ON CONSTRUCTION GRANTS 1982, SECTIONS 6.2 AND 6.3

Field work necessary to thoroughly evaluate the condition of individual on-site systems and to select technology for necessary upgrading or replacement is generally to be viewed as Step 2 or Step 2 + 3 work. Typical field work for this level of analysis includes completion of the sanitary survey and, as appropriate to each building, installation and monitoring of water meters, inspection of septic tanks, rodding house sewers and effluent lines, probing or limited excavation of soil absorption systems for inspection, and other measures listed above for representative sampling. Construction of on-site replacements and upgrading may proceed in tandem with this site specific analysis provided:

- state and local officials concur (their prior concurrence might be limited to standard systems),
- contract language allows for flexibility in the facilities to be constructed,
- property owner concurrence with the selected alterations is obtained, and
- additional cost-effectiveness analysis to support technology selection is not necessary.

Necessary state and local agency approval of off-site, non-standard, or owner-protested facilities or those requiring additional cost analysis would optimally proceed on a segment-by-segment basis to minimize the time between technology selection and construction.

The establishment of a management district's authority to accept responsibility for the proper installation, operation and maintenance of individual systems per 40 CFR 35.918-1(e) and (i) should be completed before award of Step 2 or Step 2 + 3 grants. Development of a management district's program for regulation and inspection of systems must be completed before a Step 3 grant award or before authorization to proceed with construction procurement is granted under a Step 2 + 3 grant.

## VI. Public participation

The following comments are intended to demonstrate how this guidance relates to the standard requirements for public participation. It is not all inclusive.

A. Although mailed questionnaries have limited utility for needs documentation, they can serve as useful public participation tools. A useful "mailing list" may include all owners of residences within unsewered areas in the planning area and other interested and affected parties.

The requirement for consulting with the public set forth in 40 CFR 35.917-5(b)(5) will be considered satisfied if questionnaires are submitted by individuals on the "mailing list."

B. The public meeting required by 40 CFR 35.917-5(b)(6) provides an opportunity for property owners to be informed of whether or not they have been found to need wastewater treatment facilities. During the meeting they can respond to the consultant's determination of their need status. A map with each lot designated as no-need, obvious-problem, or inconclusive would be helpful for public understanding. This meeting could be conveniently scheduled at the end of Phase I.

C. Partial sanitary surveys conducted during Phase 2 of needs documentation offer an excellent opportunity to gain public input provided surveyors are adequately informed about the project or can refer difficult questions to a knowledgeable person for immediate response.

D. The final public hearing required by 40 CFR 35.917-5 should be scheduled at the end of facilities planning. At this public hearing a map showing service areas for grantee supervised decentralized technologies will be displayed. Within service areas, tentatively proposed methods of treatment and disposal for individual developed lots will be available to the lot owners. It should made clear to the public that site investigations conducted in Steps 2 or 3 may result in adjustments to the proposed treatment and disposal methods for individual lots.

# VII. ALTERNATIVE CONSTRUCTION GRANTS PROCEDURES FOR SMALL WASTE FLOW AREAS

## 1. INTRODUCTION

The three-step Construction Grants process requires consideration and documentation of literally hundreds of topics or activities. For any one community, many of these topics or activities can be addressed cursorily, thereby simplifying and shortening the process. However, local decisions to pass over items can be expensive and time-consuming if state or U.S. EPA officials disagree with the omissions. To a great extent, coordination between applicants and reviewing officials will minimize such omissions and their consequences. However, in any planning situation, there is an irreducible level of manpower and expertise required to ensure informed coordination and to allow for local decision-making. Many rural communities and some developing communities do not have the requisite manpower and expertise. Attempts to simplify the Construction Grants process without such appropriate decision-making capabilities can be frustrating and counter-productive.

At a minimum, completion of the Construction Grants process requires several years. New program guidance, problems in state and Federal review, contract difficulties, and other factors can prolong the process even more. The time required for the process can frustrate the individuals in a community who have taken the initiative to achieve clean water goals.

The evaluation of alternative technologies, as addressed in this document, adds to the potential number of topics and activities to be considered in rural communities. This section first addresses the differences in Construction Grants procedures between unsewered and previously sewered areas. Then, specific opportunities for facilitating the Construction Grants process are reviewed. The goal of this presentation is to explore ways of simplifying and shortening the Construction Grants process for rural and developing communities that will be evaluating alternative, particularly decentralized, technologies.

## 2. UNSEWERED VS. SEWERED AREAS: DIFFERENCES IN PLANNING, DESIGN, AND CONSTRUCTION

There are several potentially expensive and time-consuming activities that will rarely be necessary in unsewered areas. These include:

- Infiltration/Inflow analysis,
- Sewer System Evaluation Survey,
- Sewer rehabilitation,
- Location, design, flows, and performance of existing treatment plants (although small privately owned plants may be present),
- Industrial pretreatment program (although individual plants may be treating and disposing of process wastes), and
- Value engineering.

On the other hand, long-standing requirements to inventory existing treatment systems and to evaluate optimal operation of existing facilities have been reinforced in unsewered areas by provisions of the Clean Water Act and related regulations that make existing on-site systems eligible for upgrading and replacement.

Activities that may be necessary for the inventory and evaluation include, but are not limited to:

- Compilation and review of septic tank and well records,
- Interviews with responsible officials, septic tank contractors and well drillers,
- Review of soils data,
- Calculation of lot sizes,
- Estimation of depths to water tables,
- Aerial photography interpretation for identification of surface malfunctions,
- Leachate detection surveys of ground and surface waters,
- Mailed questionnaires to residences,
- Base map and overlay preparation showing soil, groundwater, and geologic conditions along with identified failures,
- Representative sampling of depths to water tables, groundwater flow, well water contamination, shallow groundwater contamination, and soil permeability,
- Sanitary surveys involving resident interviews and property inspections,
- Supplemental site analysis, such as inspection of septic tanks, house sewers, and effluent lines, and probing or limited excavation of soil absorption systems, to determine causes of failure,
- Delineation of centralized and decentralized service areas,
- Development of monitoring programs for ground and surface waters, and
- Pilot programs to evaluate innovative or subcode wastewater technologies and flow reduction devices.

Eligibility requirements for individual systems (and, by analogy, other on-site and decentralized facilities) include applicant certification that... "such treatment works will be properly installed, operated, and maintained and that the public body will be responsible for such actions." Management and implementation measures that need to be addressed in response to this requirement include:

- Methods of securing access to facilities on private property,
- Review and possible modification of current regulations and legal authorities, and
- Delineation of private/public/contractor functions and responsibilities.

A major difference between centralized and decentralized approaches is the degree to which feasible technologies can be selected with the level of field data collection normally allowed for facilities planning (Step 1). For centralized technologies, field data needed to address feasibility and approximate cost seldom go beyond soil borings to determine subsurface conditions for pipe installation and foundation support. Given the assumptions of proper engineering and operation, it is presumed that conventional, centralized collection and treatment facilities will operate reliably. However, performance data on many decentralized technologies are insufficient to support such generalities. Because of this and because of dependence on conditions at many sites instead of one or a few, field data collection for decentralized facilities must be more extensive. Yet, if all available means of site analysis were applied to each existing building in a facilities planning area, the costs of data collection would substantially reduce, and perhaps exceed, the savings due to the lower costs of decentralized facilities. The need for effective management of field data collection efforts is obvious.

In terms of time and cost, increased requirements for field data collection are offset by decreased requirements for design work. The keys to most design problems for decentralized technologies are selection of the appropriate technologies and knowledge of the individual site. Structural, mechanical, and electrical design elements will normally be trivial compared to those for centralized technologies. Designs and specifications for many on-site technologies can be standardized for any given community. Designs and specifications for systems requiring construction variances and for off-lot technologies will be more demanding, but will seldom require the effort needed for the more complex processes and structures of most mechanical, centralized technologies.

## 3. FACTORS AFFECTING PROJECT COMPLEXITY

The opportunities discussed below to reduce project duration and complexity apply to a number of facilities planning elements. Three elements, however, are likely to be of greatest consequence. These are:

1. Need for both centralized and decentralized facilities,
2. Lack of performance, design, and usage information for existing wastewater facilities, and
3. Community development goals.

Many rural and developing communities have existing sewer and centralized treatment systems or have housing and commercial densities sufficiently high to make centralized systems cost-effective for part of the facilities planning area. The need for or, particularly, the presence of, sewer systems essentially creates two planning, design, and construction projects within a community. In the past, the decentralized project has either been ignored or sewers have been extended into areas where decentralized technologies would have been cost-effective. The Clean Water Act, regulations supporting the Act, and conclusions of the Seven Rural Lake EIS's demand that decentralized projects be seriously considered unless no need exists for improvements in unsewered areas of a community. Two projects with dissimiliar information requirements, planning and impact considerations, and design procedures are obviously going to be more complex technically. Local administration of grants and local decision-making may require more effort and sophistication than either centralized or decentralized projects alone.

As discussed above, selection of decentralized technologies is highly dependent on field data collection. It is indicative of traditional management practices for decentralized systems that performance and usage data are almost always lacking and that design information is reliable for only the past ten, or at the most twenty, years of installation. Costs and time required for data collection can become exorbitant if not well managed. To address the necessary balance between need for data and the cost and time for obtaining it, U.S. EPA Region V in conjunction with states in the region has prepared "Region V Guidance - Site Specific Needs Determination and Alternative Planning for Unsewered Areas." The current version is attached as Appendix A to this section. Basically, the guidance describes a sequential process with decisions after each step on technology selection and the scope of subsequent, more detailed field studies.

Other matters besides field data affect the outcome and timing of decisions to sewer or not. The sooner in Step 1 that this decision is made or that service areas for sewered and non-sewered approaches are delineated, the quicker and cheaper will the Construction Grants process be. Besides field data, three matters are of primary importance:

1. Cost-effectiveness,

2. Risk of selecting the wrong approach, and

3. Compatibility between local growth objectives and development capacity of the selected technology.

To enable preliminary comparisons of cost-effectiveness for various centralized and decentralized technologies, the Cost-Variability Study reported in Chapter IV A. has been prepared. The methods developed there are based upon readily available housing density, topographic, and soils data. Applicants can use the cost curves either during preparation of their Plan of Study or early in Step 1 to generate rough present-worth costs. Early decisions can then be made regarding areas that definitely would or would not be cost-effective to sewer and areas where more work is necessary to reach this conclusion. For parts of a community where sewers are clearly not cost-effective, sequential approaches to data collection may be short-circuited and full-scale site analysis might be initiated thereby saving time and redundancy in field trips.

Any decisions made to use decentralized technologies before all relevant data are collected contain the risk of reversal when final and complete data become available. Obviously, the more data on hand, the less risk is involved in making such a decision. The most likely consequences of the decision's being reversed are the time and cost of redundant planning and design activities. In the event that decentralized facilities are upgraded or installed, and then fail, the consequences of being wrong are more substantial. Additional expenditures for cluster systems, holding tanks or sewers may be required.

Finally, it is often the case that community objectives in applying for Construction Grants assistance are more related to growth and development than to resolution of water quality and public health problems. For areas where sewering is needed and is cost-effective, this emphasis creates few conflicts with Construction Grants funding goals. Indeed, cost-effectiveness criteria allow for sewer and for treatment capacity to accommodate 20 years of growth at "reasonable rates." Additional capacity can be bought by the applicant at the margin--that is, for its incremental cost.

In contrast, decentralized technologies, especially on-site systems, provide little or no reserve capacity for new development. Reserve capacity is dependent on the stock of land suitable for development with these technologies. (See futher discussion in Chapter VIII.A.)

Therefore, if decentralized facilities are likely to be cost-effective solutions to local water quality problems, some applicants may want to initiate early public debate on growth and alternate funding of centralized technologies. Other applicants may want to incorporate planning tools in their Step 1 application that assess the stock of suitable land. (See Chapter IX.B. for an example).

## 4. OPPORTUNITIES FOR FACILITATING THE CONSTRUCTION GRANTS PROCESS

### a. Managing Field Data Collection

Identifying the Need for Field Data Collection. Three sources in existing regulations and guidance relate to how much and what type of data are required in Facilities Plans (Step 1). 40CFR 35.917-4 titled "Planning Scope and Detail" states:

> (b) Facilities planning shall be conducted only to the extent that the Regional Administrator finds necessary in order to insure that facilities for which grants are awarded will be cost-effective and environmentally sound and to permit reasonable evaluation of grant applications and subsequent preparation of designs, construction drawings and specifications.

Program Guidance Memorandum 79-8 states in part:

> Though house-to-house visits are necessary in some areas, sufficient augmenting information may be available from the local sanitarian, geologist, Soil Conservation Service representative or other source to permit preparation of the cost-effective analysis. Other sources

include aerial photography and boat-carried leachate-sensing equipment which can be helpful in locating failing systems. Detailed engineering investigation, including soil profile examination, percolation tests, etc., on each and every occupied lot should rarely be necessary during facilities planning.

These statements agree in intent. Only the second source provides guidance on field data collection, and this guidance is general in nature. The intent, however, is to prohibit overly conservative data collection programs. Appendix A, "Region V Guidance-Site Specific Needs Determination and Alternative Planning for Unsewered Areas" addresses the need for data in more detail.

The third source of guidance does not discuss data collection directly, but could be interpreted as calling for comprehensive data in Step 1. 40 CFR 35.917-1, "Content of Facilities Plans" states in part:

> (b)...For individual systems, planning area maps must include those individual systems which are proposed for funding under § 35.918.

If this is taken to mean that every system with problems has to be located or that the specific on-site technology proposed for funding has to be selected, then all of the field work otherwise reserved for Step 2 would have to be done during Step 1. While this may be appropriate for communities with low levels of problems amenable to conventional on-site measures (as discussed later in this section), it would not be appropriate for many communities where collection of the data would hold up other activities and decisions.

Timing. Several types of field data are best collected during certain parts of the year. Examples are:

| Method | Time Limitation |
|---|---|
| Sanitary Survey - permanent residents | Wet weather; spring |
| Sanitary Survey - seasonal residents | Summer; in some cases winter |
| Aerial Photography | After snow melt-before tree foliation; after leaf fall |
| Groundwater Depth Determination | Wet weather |
| Septic Leachate Detections | Variable. Depends on seasonal occupancy patterns and weather |

For any of these methods, usable data can be collected at other times. However, there is a risk of having to repeat them should the data be insufficient or inconclusive. Decisions about balancing this risk with the costs of delay should be made with the assistance of persons familiar with the methods and how they relate to alternatives development and subsequent technology selection.

Early Collection of Available Data. Decisions on delineation of centralized and decentralized service areas are key to expeditious completion of Step 1 facilities planning. Plans of study can be much more specific and service area delineations could be made earlier, if available data is collected as described in "Region V Guidance-Site Specific Needs Determination and Alternative Planning for Unsewered Areas" (Appendix A) were started or substantially completed before Step 1. This could be accomplished in two ways: by the applicant or by regional planning agencies.

First, the applicant should have access to available data on existing on-site systems. This information should include well and septic tank permits, lot sizes, and soils maps. Some of this should be reviewed in preparing a Plan of Study for unsewered areas anyway. A more extensive review, perhaps including graphic presentation of the data, and interviews with septic tank installers and haulers would be even more informative. This often could be accomplished by existing public works, health department or planning agency staff during winter months or other periods when ordinary demands for their services are low

Regional or state agencies could also compile available data. Several 208 agencies in Region V have already collected data relevant to performance of on-site systems (See Chapter XV-C). Significant economies of scale could be achieved by having knowledgable regional planning agency staff compile available data and organize community survey data collection in advance of rural 201 planning within an agency's planning area. Possible sources of funding for such efforts include:

- Section 106 grants (grants to states and interstate agencies to assist them in administering pollution control programs), and
- Section 205(g) (grants to states to administer Sections 201, 203, 204 and 212).

Avoiding Duplication of Effort. The data collection and decision-making steps described in "Region V Guidance..." (Appendix A) could result in several return visits to individual residences or businesses. Besides the cost of mobilizing personnel, numerous visits could unnecessarily interfere with privacy and thereby decrease public support for the project. Suggestions for minimizing return visits include:

- Mailed questionnaires can provide a certain level of problem documentation but seldom yield complete returns and cannot be expected to develop information for alternative development or subsequent technology selection. They require the recipient to respond and to return the questionnaire--to some people a greater intrusion than answering questions from an interviewer. For these reasons, it is recommended that mailed questionnaires be used only where previously available data indicate very low problem rates (to support No Action alternatives) or very high problem rates (to support central collection and treatment alternatives).
- Field verification of aerial photographic interpretations could be accomplished along with sanitary surveys.

- Each visit to a dwelling or business should result in as much unequivocal data as possible. Sanitary survey formats developed during preparation of the Seven Rural Lake EIS's require a substantial amount of data to be requested from the occupant and recorded. Gaining the needed information before the patience of either the surveyor or occupant runs out requires that the surveyor understand on-site systems and local jargon (see Staffing below). Additional information sheets can be added to the survey format. However, as increased data requirements are added, the skill of the interviewer should also increase.

- Sanitary surveys are intended to collect data useful for subsequent technology selection if decentralized approaches are selected. Reducing the scope of information in the survey format or using surveyors whose skills are below the minimum will only thwart that intention and ultimately necessitate return visits.

- Soil or well water sampling conducted to support sanitary surveys should either be concurrent with the interview and site inspection or scheduled to take place as soon thereafter as possible. Occupancts will readily forgive a few days' lag between interview and sampling if warned of the "second part of the survey" in advance. Longer delays may be seen as new intrusions. Waiting for the second visit may create subtle anxieties that increase occupant resistance.

- Where access agreements must be sought from each property owner, the sanitary surveyor should have the necessary forms available and should be able to respond to related questions or have ready access to someone who can.

- Detailed site analysis (which could include water meter installation, excavations of septic tanks and portions of soil absorptions, and augering holes for groundwater or soil sampling) is likely to be the most intrusive procedure short of actual upgrading or system replacement. Optimally, all detailed site analysis on a lot would be done in one or two days. Contractors or public employees doing this work should be required to restore the site before leaving it.

Staffing. The success of some data collection efforts is dependent on the personnel selected. Some methods, such as aerial photography interpretation for surface malfunctions, and septic leachate detection, must be carried out by professionals. Other methods require only professional supervision or input; these would include sanitary surveys and site analysis. Much of the effort could be provided after some training by local residents whose main qualifications are familiarity with the community and a willingness to achieve good sanitation and water quality.

As with the design of field studies, designation of the types of personnel to be used should be made by persons who understand Construction Grants procedures for rural areas and who can weigh the cost and skills of potential personnel against data requirements for decision-making.

An effective way to minimize time required for Construction Grants activities is to assign or hire key staff for the management agency as early as possible. Continuity of decision-makers from Step 1 through implementation of the agency and facilities construction will make for better decisions. Also, key staff involvement in planning, design and construction of a project will be excellent preparation for subsequent decisions during long term operations.

### b. Planning Considerations

Voluntary Participation in the Construction Grants Process. Much of the discussion here assumes that counties or municipalities will be designating parts or all of their jurisdictions as wastewater service areas and that either centralized or decentralized wastewater management will be provided to all buildings in the designated service areas. Construction Grants regulations (especially 40 CFR 35.918) and the nature of decentralized facilities provide an alternate approach--that is, participation only by owners who volunteer. The advantages of this approach include:

- Rapid identification of sites to be evaluated. Instead of community-wide surveys, sanitary surveys, etc., the applicant would publicize data on soil conditions and past failure rates, then designate a place for owners to sign up for assistance.
- Access considerations would be reduced to requiring contractual permission to enter property as needed for inspection and repairs as a condition of grant assistance.
- Field data collection could be limited to detailed site analysis in Step 1. Individual sites could be demonstrated in the Facilities Plan as called for in 40 CFR 35.917-1. Technologies could be selected for each site in Step 1.
- Step 2 work for this approach would be relatively trivial.

This approach would be appropriate for areas with relatively low housing densities, with no unusually sensitive surface or groundwater resources and with problems amenable to on-site solutions. Where these conditions are not met, the following disadvantages may be encountered:

- Serious public health and water quality problems may be missed. Individuals who know they have difficult problems with solutions that require high operational costs may not find grant assistance for construction very attractive.
- Unless most occupants in segments with high density or high failure rates volunteer, feasible off-site solutions may not be affordable by those who do seek relief.

The applicant's decision to adopt this voluntary approach can be made any time during Steps 1 and 2. However, within limits, the decision should be made as soon as possible to gain the advantages cited.

Initiate Analysis of Growth Objectives and Impacts Early. This subject has been discussed in detail in Section 3 above.

*Initiate Management Planning Early*. Planning of management approaches that complement decentralized technologies can be a complex process. Although most of the decisions are based on common sense, many types of information are needed to make good decisions. Communities that forsee the need for management approaches discussed in Part Two of this document could save time in Steps 1 and 2 by examining the following topics at the onset of Step 1:

- Inventory skills of existing personnel that might be available from local, state, and Federal agencies and from consultants and contractors. (See Chapter VI.C.)
- Assess the impacts of existing regulatory authorities on the local management agency's design.
- Familiarize local decision makers and the interested public with the functions that may be required and options for providing those functions (See Chapter VI. A and B. and Chapter VII).

*Begin Pilot Renovation and Flow Reduction Studies in Step 1 or 2*. Technology selection, whether at the end of Step 1 or in Step 2, will take into account the probability that various modification or replacement technologies will perform as expected. A number of potentially useful technologies are not well demonstrated, however. Most alternatives may never have been tried in a specific community or physiographic province. Technology selection will be improved if some of the most promising techniques have been installed and monitored locally for a period of time.

At present, such initiatives could only receive Federal funds if applied for separately from the Facilities Plan grant. Coordination and timing of separate grants in order to get timely performance data would certainly add complexities--complexities that may not be worth the trouble.

In order to achieve the benefits of technology demonstration at the local level, the Regional Administrator could allow Step 1 or 2 funding of construction and monitoring provided that the applicant can justify its applicability and utility to wastewater management decisions for the rest of community or physiographic province.

*Establish Standard Design Packages*. Specifications and layouts for various decentralized technologies will be similar for many individual sites. Time and effort may be saved in Step 2 by the development and description of standard specifications and layouts. Designers should be allowed flexibility within the standard design packages to accommodate individual site characteristics.

## C. Sequences For Field Data Collection, Alternatives Development, and Design of Decentralized Approaches

"Region V Guidance - Site Specific Needs Determination and Alternative Planning for Unsewered Areas" (Appendix A) defines an approach to rural wastewater planning that is generally applicable to a wide variety of rural planning situations. This section discusses modifications to the planning sequence reflected in the guidance. The section also reviews factors to be considered in selecting these modifications. In very general terms, persons considering modifications should constantly weigh the following objectives:

| Minimize | | Minimize |
|---|---|---|
| Planning time and cost | | Repetitious field work |
| Design time and cost | vs. | Repetitious cost analysis |
| Intrusion on occupants | | Premature failure of selected technologies |

The subjects discussed in this section will have to be considered along with other planning and design exercises such as environmental analysis, management agency design, and public participation. However, to make the concepts discussed manageable, this section primarily considers the impact of field data collection on the development of alternatives and the transformation of the selected alternative into a design that can be bid for and built.

Figure XVI-D-1 portrays sequences for data collection, alternatives development, and supporting cost analysis consistent with "Region V Guidance." There are four implicit assumptions incorporated into the Guidance and Figure XVI-D-1:

1) There exists very meager data prior to Step 1 that reliably define the design, usage, and performance of existing on-site systems.

2) Service areas cannot readily be delineated for centralized collection and treatment, community supervision of decentralized facilities, or no action.

3) The severity of existing and potential problems with on-site systems justifies active community management of all or a significant fraction of the systems.

4) Technologies to replace and upgrade existing on-site systems will include substantial use of off-site, innovative and/or subcode designs, thereby necessitating delays in technology selection until all individual developed sites are thoroughly surveyed and analyzed.

Note that all four assumptions are pessimistic. Lacking information to the contrary, such assumptions should be made by applicants and grant administrators. This is appropriate because the pessimistic assumptions necessitate more data collection. The high level of data collection also has to be staged by the introduction of several decision points for the sake of flexibility and ultimate economy.

Depending on verification or rejection of these four assumptions, six modifications to Figure XVI-D-1 consistent with overall time, cost, and complexity objectives, can be considered:

1) Collect and review all available data prior to Step 1 (See Section G.4.a. of this Chapter). This could facilitate modifications 5 and 6 below.

Figure XVI-D-1. Data collection and alternatives development for unsewered areas. Sequence 1 - Region V guidance.

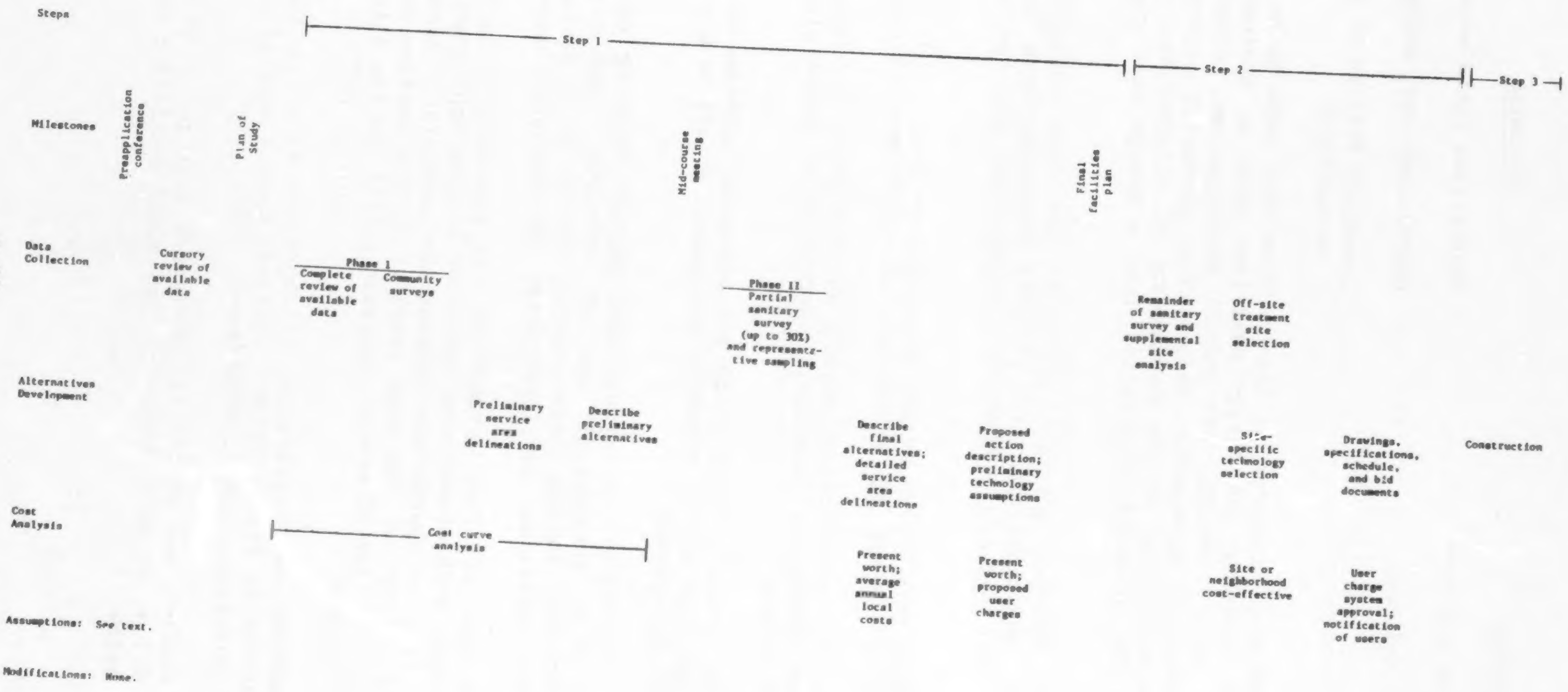

Steps
Step 1
Step 2
Step 3
Milestones
Preapplication conference
Plan of Study
Mid-course meeting
Final facilities plan
Data Collection
Cursory review of available data
Phase I
Complete review of available data
Community surveys
Phase II
Partial sanitary survey (up to 30%) and representative sampling
Remainder of sanitary survey and supplemental site analysis
Off-site treatment site selection
Alternatives Development
Preliminary service area delineations
Describe preliminary alternatives
Describe final alternatives; detailed service area delineations
Proposed action description; preliminary technology assumptions
Site-specific technology selection
Drawings, specifications, schedule, and bid documents
Construction
Cost Analysis
Cost curve analysis
Present worth; average annual local costs
Present worth; proposed user charges
Site or neighborhood cost-effective
User charge system approval; notification of users
Assumptions: See text.
Modifications: None.

Figure XVI-D-2. Data collection and alternatives development for unsewered areas. Sequence 2 - volunteer participation by owners.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Steps | | Step 1 | | | | | | Combined 2 & 3 | |
| Milestones | Preapplication conference | | | | Mid-course meeting | | Final Facilities Plan | | |
| Data Collection | Cursory review of available data | Phase I<br>Complete review of available data | Community Surveys | Advertise results and offer assistance to owners | Phase II<br>Sanitary survey and supplementary site analysis of volunteered buildings | | | | |
| Alternatives Development | | | | | | Site-specific technology selection | Proposed action description; standard designs and specifications | Schedule and bid documents | Construction |
| Cost Analysis | Cost curve analysis | | | Advertise typical total owner costs for various types of construction | | Site cost-effectiveness comparisons of competing technologies | Present worth; proposed user charges | User charge system approval; notification of users | |

Assumptions:

- Centralized solutions are known to be inappropriate before submission of Plan of Study.
- Standard on-site upgrading and replacement are suspected to be sufficient at end of Phase I; verified by end of Phase II.
- Service area defined by individual property owners who volunteer for grant assistance.

Modifications:

4) Sanitary surveys and supplemental site analysis for all volunteer-owned buildings in Phase II.
5) Technology selection and preparation of standard designs and specifications in Step 1.
6) Combined Step 2 & 3 grant.

2) Conduct community surveys prior to Step 1 (see Section G.4.a. of this chapter). This could facilitate the same modifications as above.

3) Include supplemental site analysis and cost-effectiveness comparisons (see Chapter II-H) for buildings in Phase II sanitary survey (up to 30% of buildings). This could enable modifications 5 and 6, depending on conclusiveness of the data.

4) Include sanitary surveys and supplemental site analysis for all decentralized service area buildings in Phase II. This would substantially abbreviate Step 2 and more conclusively allow modifications 5 and 6.

5) Complete technology selection and preparation of standard designs and specifications in Step 1. This could facilitate Modification 6.

6) Complete technology selection, design of non-standard on-site systems and construction with a Step 2 and 3 grant. This modification is subject to 40 CFR 35.909, .920-3(d) and .935-4.

Decisions to adopt these modifications may reasonably be considered as milestones before and during Step 1, including the preapplication conference, Plan of Study, mid-course meeting, public hearings, and final Facilities Plan.

Specific modifications taken from the list of six in preceding paragraphs are noted for each alternate sequence.

Several possible modified Construction Grants sequences are portrayed in Figures XVI-D-2 through 6. All of the sequences assume that decentralized technologies are selected in the end. This obviously will not be the case for all unsewered areas, but the several milestones allow for modifying future work to incorporate selection, design, and construction of centralized alternatives as appropriate.

The sequences vary in the degree to which the Proposed Sections identify the technologies specified for each building. Sequences 1, 3, and 5 end Step 1 with "preliminary technology assumptions," which would include:

- Detailed service area delineations (sewered, grantee managed decentralized facilities, or no action),
- Within decentralized service areas, identification of neighborhoods probably requiring off-site treatment,
- For off-site decentralized facilities (including septage disposal), identification of apparently suitable soils and expected availability of sites, and
- For the remainder of decentralized service areas, predictions based on available data and field data collection of the mix of technologies, including no action, for upgrading and replacing existing on-site systems. Tentatively proposed methods of treatment and disposal for individual developed lots should be available to lot owners at the final public hearing on the Facilities Plan (see Appendix A, Part VI.D.).

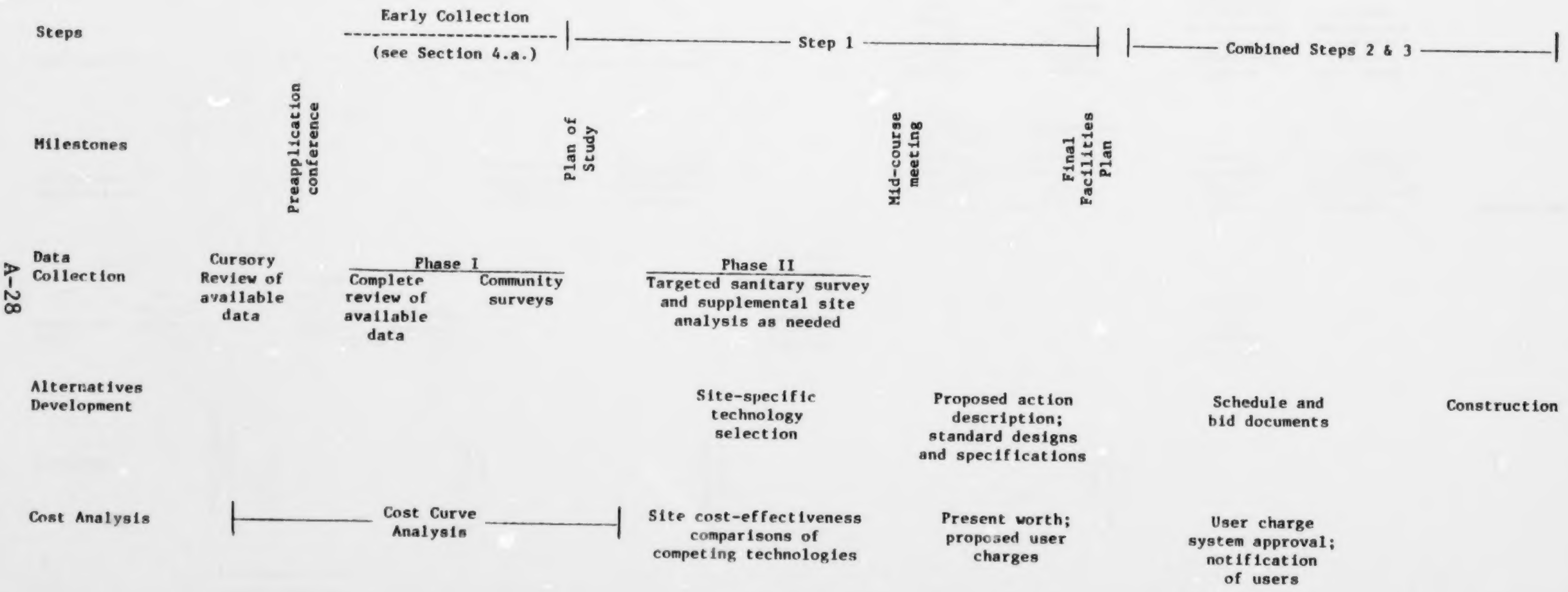
Figure XVI-D-3. Data collection and alternatives development for unsewered areas. Sequence 3 - early review of available data/complex solutions.

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Steps | Early Collection<br>(see Section 4.a.) | Step I | | | | | | Step 2 | | Step 3 |
| Milestones | Preapplication conference | | Plan of Study | Mid-course meeting | | | Final Facilities Plan | | | |
| Data Collection | Cursory review of available data | Phase I<br>Complete review of available ddta | Community surveys | | Phase II<br>Targeted sanitary survey and supplemental site analysis as needed | | | Off-site treatment site selection | | |
| Alternatives Development | | | Preliminary service area delineations | Describe preliminary alternatives | | Final alternatives descriptions; detailed service area delineations | Proposed action description; preliminary technology assumptions | Site-specific technology selection | Drawings, specifications, schedule and bid documents | Construction |
| Cost Analysis | | Cost curve analysis | | | | Present worths; average annual local costs | Present worths; proposed user charges | Site or neighborhood cost-effectiveness of competing technologies | User charge system approval; notification of users | |

Assumptions:
- Available data along with community surveys are conclusive enough to target Phase II on problem areas.
- Data indicate need for complex mix of on-site and off-site technologies or possibility of substandard or innovative technologies.
- Service areas defined by need and cost-effectiveness — consequences of doing nothing are unacceptable.

Modifications:
1. Collect available data prior to Step 1.
2. Conduct community surveys prior to Step 1.
4. Sanitary surveys and supplemental site analysis for all buildings in potential decentralized service areas targeted in Phase I.

Figure XVI-D-4. Data collection and alternatives development for unsewered areas. Sequence 4 - early review of available data/standard on-site upgrading and development.


Steps
Early Collection
(see Section 4.a.)
Step 1
Combined Steps 2 & 3
Milestones
Preapplication conference
Plan of Study
Mid-course meeting
Final Facilities Plan
Data Collection
Cursory Review of available data
Phase I
Complete review of available data
Community surveys
Phase II
Targeted sanitary survey and supplemental site analysis as needed
Alternatives Development
Site-specific technology selection
Proposed action description; standard designs and specifications
Schedule and bid documents
Construction
Cost Analysis
Cost Curve Analysis
Site cost-effectiveness comparisons of competing technologies
Present worth; proposed user charges
User charge system approval; notification of users

**Assumptions:**

- Centralized solutions are known to be inappropriate before submission of Plan of Study.
- Standard on-site upgrading and replacement are suspected to be sufficient based on available data; verfied by community surveys and Phase II.
- Service areas defined by need -- consequences of doing nothing are unacceptable.

**Modifications:**

1. Collect available data prior to Step 1.
2. Conduct community surveys prior to Step 1.
4. Sanitary surveys and supplemental site analysis for all buildings targeted in Phase I.
5. Technology selection and preparation of standard designs and specifications in Step 1.
6. Combined Steps 2 & 3 grant.

Figure XVI-D-5. Data collection and alternatives development for unsewered areas. Sequence 5 - available data and community surveys sufficient for Step 1.

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Steps** | | Step 1 | | | | | | Step 2 | | Step 3 |
| **Milestones** | Preapplication conference | Plan of Study | | | | Mid-course meeting | Final Facilities Plan | | | |
| | | Phase I | | | | | | Phase II | | |
| **Data Collection** | Cursory review of available data | Complete review of available data | Community surveys (if needed) | | | | | Targeted sanitary survey and supplemental site analysis as needed | Off-site treatment site selection | |
| **Alternatives Development** | | | | Detailed service area delineations | Describe preliminary alternatives | Describe final alternatives | Describe proposed action; preliminary technology assumptions | Site-specific technology selection | Drawings specifications schedule and bid documents | Construction |
| **Cost Analysis** | | | | Cost curve analysis | | Present worths; average annual local costs | Present worths; proposed user charges | Site or neighborhood cost-effectiveness of competing technologies | User charge system approval; notification of users | |

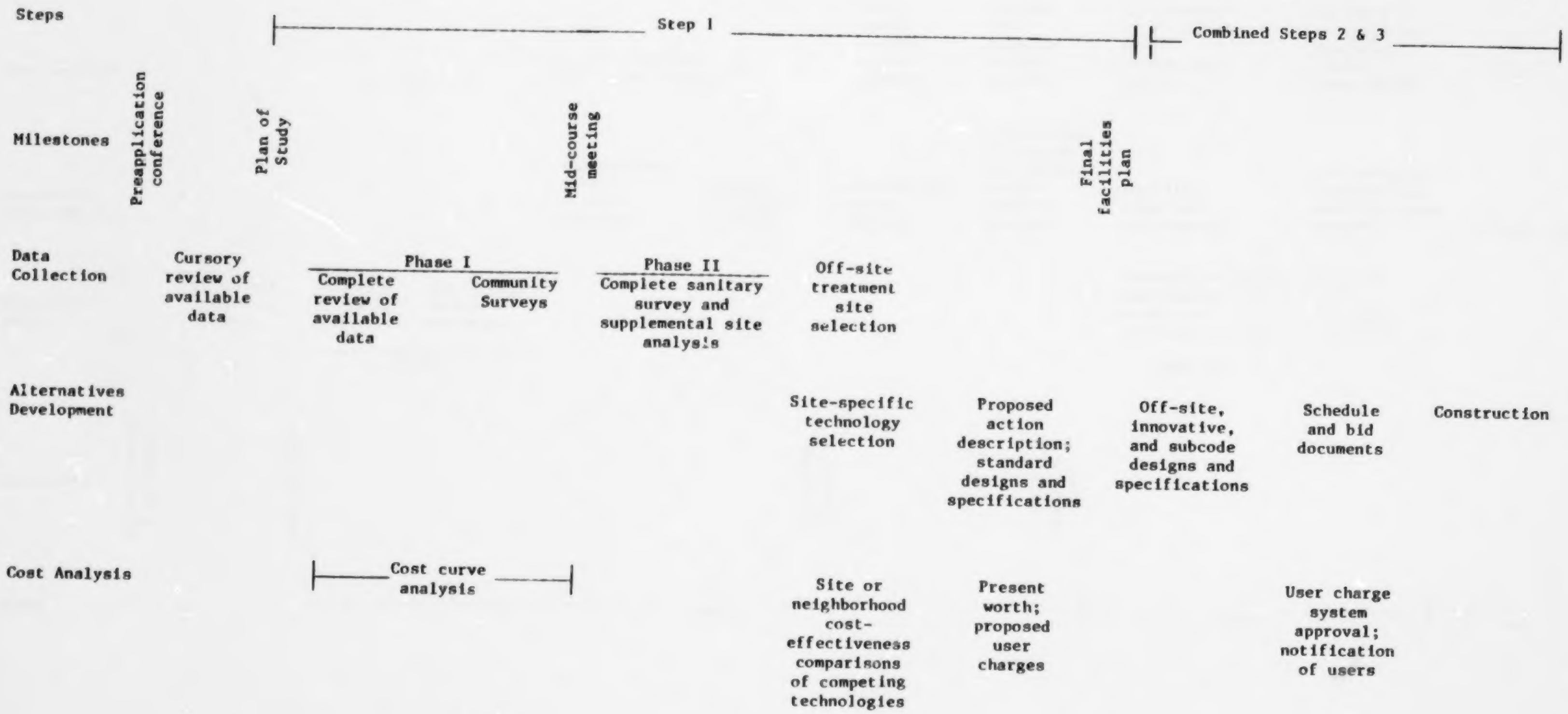
**Assumptions:**

- Available data are sufficient to describe design, usage, and performance of existing systems. Service areas and technologies can be selected using available data.

**Modifications:**

- Step 1 consists primarily of paper studies. Field data collection has minimum redundancy and can be scheduled well in advance for best timing.

Figure XVI-D-6. Data collection and alternatives development for unsewered areas. Sequence 6 - no need for centralized facilities/expounded Step 1.


Steps
Step 1
Combined Steps 2 & 3
Milestones
Preapplication conference
Plan of Study
Mid-course meeting
Final facilities plan
Data Collection
Cursory review of available data
Phase I
Complete review of available data
Community Surveys
Phase II
Complete sanitary survey and supplemental site analysis
Off-site treatment site selection
Alternatives Development
Site-specific technology selection
Proposed action description; standard designs and specifications
Off-site, innovative, and subcode designs and specifications
Schedule and bid documents
Construction
Cost Analysis
Cost curve analysis
Site or neighborhood cost-effectiveness comparisons of competing technologies
Present worth; proposed user charges
User charge system approval; notification of users

Assumptions:
- Phase I data indicate no need for centralized facilities.
- Volunteer approach not justified because of adverse impacts of owners doing nothing.

Modifications:
4. Sanitary surveys for all buildings and supplemental site analysis as necessary in Step 1.
5. Technology selection and preparation of standard designs and specifications in Step 1.
6. Combined Steps 2 & 3.

A number of officials have expressed concern with this level of technology specification. The primary purpose for allowing less than absolute descriptions of funded facilities is to expedite Step 2 work on conventional centralized treatment works. For facilities planning areas where Phase I information indicates that centralized technologies will not be necessary, all or most field data collection could be scheduled and completed in Step 1, as portrayed in sequences 2, 4, and 6. Alternatively, if centralized technologies are necessary, the project could be segmented and sequences 2, 4, or 6 could be used for decentralized service areas.

### d. Administrative Measures

Administrative measures to facilitate the construction grants process in rural and developing communities include:

- Overcome local unfamiliarity with the Construction Grants process. The optimium means for doing this is to train a local elected or salaried official by intensive review of regulations or by short courses developed for this purpose. Regional or state officials may often be very helpful in training local officials or actually providing assistance in grant application and administration. Delegation of local grant responsibilities to facilities planning and design consultants is typically practiced, but is not always the best solution (see Chapter V).

- Use of milestones for decision-making. Several times during the Construction Grants process, applicants are required to consult with state or Federal reviewing agencies. Examples of interest are the preapplication conference and the mid-course meeting in Step 1. These meetings can be used to identify reasonable short cuts in field data collection, alternatives development, environmental analysis, etc. Informal contacts between applicants and reviewing agencies frequently occur and can also be useful in tailoring the process to local situations.

- Segment projects for centralized and decentralized service areas. Because of substantial differences in the Construction Grants process for centralized and decentralized facilities, letting different service areas proceed at their own pace may achieve project goals for each part more rapidly. A typical objection to such segmenting is based on fears that the state priority rating given decentralized projects may be too low to set funding. This topic is addressed in Chapter XV-D.

- Enact county ordinances and/or state legislation enabling provision of access to private systems. In many communities, housing density, frequency of failures, or sensitivity of water resources are high enough to require comprehensive management approaches (as opposed to voluntary approaches). Gaining legal access to survey, test, upgrade, replace, and maintain on-site systems can complicate and delay needed action on some properties. This can be overcome by legislation reasonably designed to protect the public's interest in water quality and public health.

- Amend facilities planning guidance to reflect the need for site data in developing, designing and constructing decentralized facilities. Existing (February, 1981) regulations, Program Requirements memoranda, and facilities planning guidance provide insufficient information on the types of information necessary to develop and support viable decentralized alternatives. Emphasis is generally placed on documenting needs for improved wastewater facilities. However, it is one thing to document a need. It is quite another to collect sufficient information to select an alternative other than abandonment of existing systems. Applicants and facilities planners would be well served by a greater emphasis in the regulatory literature on data requirements for alternatives to sewering.

# APPENDIX B

# ON-SITE SANITARY INSPECTION FORM

## SANITARY SURVEY FOR CONSTRUCTION GRANTS APPLICATION

Resident:

Owner:

Address of Property:

Lot Location:

Tax Map Designation:

Study Area:

Surveyor/Date:

Weather:

Approximate Lot Dimensions:

______feet by _________feet

### Preliminary Resident Interview

Age of Dwelling: ___ years    Age of sewage disposal system: ____years

Type of Sewage Disposal System:

Maintenance: ____years since septic tank pumped. Reason for pumping:______________
____years since sewage system repairs (Describe below)
Accessibility of septic tank manholes (Describe below)

Dwelling Use: Number of Bedrooms:____actual, ____potential, ____ Planned
Permanent Residents:____adults, ____children
Seasonal Residents:____, length of stay____
Typical Number of Guests:____, length of stay____

If seasonal only, plan to become permanent residents:____ In how many years?____

Water Using Fixtures (Note "w.c." if designed to conserve water):

____Shower Heads
____Bathtubs
____Bathroom Lavoratories
____Toilets

____Kitchen Lavoratories
____Garbage Grinder
____Dishwasher
____Other Kitchen

____Clothes Washing Machine
____Water Softener
____Utility Sink
____Other Utilities

Plans for Changes:

Problems Recognized by Resident:

Resident Will Allow Follow-Up Engineering Studies: ____Soil Borings _____Groundwater
____Well Water Sample

## SANITARY SURVEY FOR CONSTRUCTION GRANTS APPLICATION

### Water Supply

Water Supply Source (check one) _____ Public Water Supply
_____ Community or Shared Well
_____ On-Lot Well
_____ Other (Describe)

If public water supply or community well:
_____ Fixed Billing Rate $ /
_____ Metered Rate $ /
Average usage for prior year: /

If shared or on-lot well:
_____ Drilled Well
_____ Bored Well
_____ Dug Well
_____ Driven Well

Well Depth (if known): _____ feet total _____ feet to water table

Well Distance: _____ feet to house _____ feet to septic tank
_____ feet to soil disposal area _____ feet to surface water

Visual Inspection: Type of Casing

Integrity of Casing

Grouting Apparent?

Vent Type and Condition

Seal Type and Condition

Water Sample Collected:

_______ No

_______ Yes

(Attach Analysis Report)

# SANITARY SURVEY FOR CONSTRUCTION GRANTS APPLICATION

Surveyor's Visual Observations of Effluent Disposal Site:

Drainage Facilities and Discharge Location:

Basement Sump

Footing Drains

Roof Drains

Driveway Runoff

Other

## Property and Facility Sketch

# APPENDIX C

## Example of a Cost Analysis for an Optimum Operation Alternative Appropriate to the First Level of Alternative Development, i.e., Technology Assumption

Source: Appendix E, Final Environmental Impact Statement - Alternative Waste Treatment Systems for Rural Lake Projects.

Case Study Number 4, Steuben Lakes Regional Waste District, Steuben County, Indiana, January, 1981.

## LIMITED ACTION ALTERNATIVE
## PRESENT WORTH, USER CHARGES

### ASSUMPTIONS

**On-Site Systems**

Year 1980 - 4171 EDU's (50% seasonal, 50% permanent)
Year 2000 - 6196 EDU's (50% seasonal, 50% permanent)
50% (4171) septic tanks to be replaced
10% (4171) ST-SAS's to be replaced

**Capital Costs**

$1,877/ST-SAS
$ 265/septic tank

**O & M**

$60/ST pumping (50% once/3 years, 50% once/5 years)
$400/$H_2O_2$ treatment (2% of drainfields/year)
$6/well sample (1/well/5 years)
$40/groundwater sample (20 tests, 3 samples/test)
Sanitarian @ $25,000/yr. - 260 days/yr.
Surveyors @ $12,000/yr. - 130 days/yr. (1980), 200/yr. (2000)
Secretary @ $12,000/yr. - 260 days/yr.
(20% fringe benefits for sanitarian, surveyors, secretary,
soil scientist @ $325/day - 51 days/yr. (½ day rentals -
see cost calculations

**Salvage Values**

50 year useful life for ST's; 20 years for all else

**Present Worth**

6 5/8%, 20 years

**User Charges**

Eligibility - 100% of site analysis and replacement system charge
Federal funding - 85% of site analysis; replacements
State funding - 6% of these items
Debt retirement - 6 7/8%, 30 years, 1980 capital
Debt reserve - 20% of debt retirement

### Alternative Costs

|  | Capital Costs | ($ x 1000)<br>O&M Costs | Salvage Value |
|---|---|---|---|
| Existing Systems: |  |  |  |
| Replace 2086 ST's | 552.8 | -0- | 331.7 |
| Replace 417 ST-SAS's | 782.7 | -0- | 66.3 |
| Pump 1043 ST's/yr. | -0- | 62.58/yr. | -0- |
| $H_2O_2$ 83 DF's/yr. | -0- | 33.20/yr. | -0- |
|  | 1,335.5 | 95.78/yr. | 398.0 |
| Future systems: |  |  |  |
| Add 2025 ST-SAS's | 190.05/yr. | 1.52/yr./yr. | 429.3 |
|  | 190.05/yr. | 1.52/yr./yr. | 429.3 |

## Alternative Costs (Continued)

| | | | |
|---|---|---|---|
| Salaries: | | | |
| Sanit. - $25,000/yr. - 260 days/yr. | -0- | 25.0/yr. | -0- |
| Surveyors - $12,000/yr. - 130 days/yr. | -0- | 6.0/yr. | -0- |
| $12,000/yr. - 3½ days/yr/yr. | -0- | 0.16/yr./yr. | -0- |
| Secretary - $12,000/yr. - 260 days/yr. | -0- | 12.0/yr. | -0- |
| | | 43.0/yr. | |
| | | 0.16/yr./yr. | |
| 20% fringe benefits | -0- | 8.6/yr. | -0- |
| | | 0.03/yr. | |
| | -0- | 51.6/yr. | -0- |
| | | 0.19/yr./yr. | |
| Retainer: | | | |
| Soil Scientist - $325/day - 51 days/yr. | -0- | 16.58/yr. | -0- |
| | -0- | 16.58/yr. | -0- |
| Water samples analyses: | | | |
| Wells - $6/sample - 834/yr. | -0- | 5.0/yr. | -0- |
| Wells - $6/sample - 20/yr./yr. | -0- | 0.12/yr./yr. | -0- |
| Shallow groundwater - $40 x 20 x 3 | -0- | 2.40/yr. | -0- |
| | -0- | 7.40/yr. | -0- |
| | | 0.12/yr./yr. | |
| Engineering, Legal, Contingencies: | | | |
| Site Analysis | 120.2 | -0- | -0- |
| Legal, etc. (9% construction cost) | 1,176.6 | -0- | -0- |
| | 1,296.8 | -0- | -0- |

## Alternative Costs

| | | | |
|---|---|---|---|
| Total Alternative Costs | | | |
| Total 1980 costs | 2,632.3 | 171.35/yr. | 398.0 |
| Total 1980-2000 costs | 190.05/yr. | 1.83/yr./yr. | 429.8 |

## Present Worths

($ x 1000)

Total Alternative P.W. = 2,632.3 + 10.9909 (171.36 + 190.05) + 81.155 (1.83) - 0.2772 (398.0 & 429.8) = 6523.7

31.155

## Local Share (1980)

($ x 1000)

1980 Local Share = 9% ($2,632.3) = 236.91

## User Charge (1980)

| | ($) |
|---|---|
| Debt Retirement - 0.07958 (9%) ($2,632,300) | 18,853 |
| Debt Reserve - 20% (above) | 3,770 |
| Annual O & M | 171,360 |
| Total 1980 annual local cost | $193,983 |

User Charge = $193,983/4171 ≈ $50/residence/year

# APPENDIX D

## Example of a Cost Analysis for an Optimum Operation Alternative Appropriate for Cost-effectiveness Comparisons of Final Alternatives

Source: Appendices D and B, Final Environmental Impact Statement, Alternative Waste Treatment Systems for Rural Lake Projects - Case Study Number 5, Ottertail County Board of Commissioners, Ottertail County, Minnesota. November, 1980.

# APPENDIX D

## Modified Limited Action Present Worth and User Charges - Otter Tail Lakes Project Area

**Assumptions**

| | | |
|---|---|---|
| Existing Systems*• | 938 ST/SAS's | Add 389 access pipes to ST's<br>Replace 525 ST's<br>Add 25 flow reductions + dosed SM's |
| | 176 Cesspools | Replace 71 with ST/SAS's<br>Replace 35 with ST/shallow DF's<br>Replace 35 with ST/dosed shallow DF's<br>Replace 35 with ST/dosed SM's |
| | 73 HT's | Add 73 flow reductions<br>Add 8 ST/shallow DF's (greywater)<br>Add 26 ST/dosed shallow DF's (greywater)<br>Add 26 ST/dosed SM's (greywater) |
| | 27 Resort Systems | Join to 13 cluster system DF's (81 EDU) |
| Future Systems*o | 361 ST/SAS's<br>115 ST/dosed shallow DF's<br>114 ST/dosed SM's<br>15 ST's joined to cluster systems (46 EDU) | |
| Labor | Sanitarian to provide administrative, engineering, and planning services - 260 days/yr<br>Surveyors to sample wells and lake shore groundwater during summer - 2 @ 60 days/yr<br>Soil Scientist on retainer to inspect sites of proposed systems - ½ day/site - 15 days/yr<br>Secretary - halftime - 130 days/yr | |
| Construction Costs | $ 100/ST access pipe<br>450/ST<br>1,010/flow reduction<br>8,400/dosed SM<br>1,270/ST/SAS<br>1,270/ST/shallow DF<br>3,270/ST/dosed shallow DF<br>8,850/ST/dosed SM<br>5,350/EDU for cluster systems (less $265 if ST not needed) | |
| Operation & Maintenance (O&M) Costs | $ 5/yr/residence for flow reduction devices<br>60/ST pumping (70% once/5 years, 30% once/3 year)<br>60/HT pumping (13 x 5 pumpings/yr, 12 x 3 pumpings 48 x 1 pumping/yr) | |

---

* ST - septic tank, SAS - soil absorption system, SM - sand mound, DF - drainfield, EDU - equivalent dwelling unit.

• Includes 1,134 residential, 17 business, and 63 resort systems.

o Includes 572 residential and 33 resort systems.

| | |
|---|---|
| | 55/yr/dosed DF for electricity and pumping maintenance<br>55/yr/residence for cluster system DF's (ST separate)<br>8/well water sample to test for bacteria-nitrate (1/5 yr/well except 2/yr/3 wells at clusters)<br>15/shallow groundwater sample to test for bacteria and nutrients (50 tests/yr 3 samples/test) |
| Salvage Values | 50 year useful life for ST's, HT's<br>20 years for dosing pumps, DF's, SM's, flow reduction,<br>$2,124/residence for cluster systems if existing ST's used,<br>1965/residence for cluster systems if existing ST's used. |
| Salaries | $25,000/yr Sanitarian's<br>$12,000/yr Secretary's<br>$12,000/yr surveyor's } +20% fringe benefits<br>$325/day Soil Scientist's |

**Costs**

($ x 1,000)

| Item | Capital Costs | O&M* Costs | Salvage Value |
|---|---|---|---|
| Existing Systems: | | | |
| 389 ST/SAS's - Add Hatches | 38.9 | 5.60/yr | 23.3 |
| 524 ST/SAS's - Replace ST's | 235.8 | 7.55/yr | 141.5 |
| 25 ST/SAS's - Add Flow Redl, SM's | 235.3 | 1.86/yr | -0- |
| 71 Cesspools - ST/SAS's | 90.2 | 1.02/yr | 19.2 |
| 35 Cesspools - ST/shallow DF's | 44.4 | 0.50 | 9.4 |
| 35 Cesspools - ST/dosed sh. DF's | 114.5 | 2.43/yr | 9.5 |
| 35 Cesspools - ST/dosed SM's | 309.8 | 2.43/yr | 9.4 |
| 13 HT's - Add Flow Reduction | 13.1 | 3.90/yr | -0- |
| 8 HT's - Add Flow Reduction + ST/Shallow DF | 18.2 | 0.82/yr | 2.2 |
| 26 HT's - Add Flow Reduction + ST/dosed shallow DF | 111.3 | 4.10/yr | 7.0 |
| 26 HT's - Add Flow Reduction + ST/dosed SM | 256.4 | 4.10/yr | 7.0 |
| 81 EDU ST/Cluster Systems | 426.2 | 5.62/yr | 167.8 |
| Subtotal | 1,894.1 | 39.93/yr | 396.3 |
| Future Systems: | | | |
| 361 ST/SAS's | 22.92/yr | 0.26/yr/yr | 130.0 |
| 115 ST/dosed shallow DF's | 18.80/yr | 0.40/yr/yr | 41.4 |
| 114 ST/dosed SM's | 50.44/yr | 0.40/yr/yr | 41.0 |
| 46 EDU ST/Cluster Systems | 12.30/yr | 0.16/yr/yr | 97.7 |
| Subtotal | 104.5/yr | 1.22/yr/yr | 310.1 |

---

* Operation and Maintenance.

| | | | |
|---|---|---|---|
| **Salaries:** | | | |
| Sanitarian @ $25,000/yr x 260 day | -0- | 25.00/yr | -0- |
| Surveyors @ $12,000/yr x 120 day | -0- | 5.54/yr | -0- |
| Secretary @ $12,000/yr x 130 day | -0- | 6.00/yr | -0- |
| Subtotal | -0- | 36.54/yr | -0- |
| 20% Fringe Benefits | -0- | 7.31/yr | -0- |
| Subtotal | -0- | 43.85/yr | -0- |
| **Retainer:** | | | |
| Soil Scientist @ 325/day x 15 day | -0- | 4.88/yr | -0- |
| **Water Sample Analysis:** | | | |
| Wells @ $8/sample x 312/yr | -0- | 2.50/yr | -0- |
| Wells @ $8/sample x 6/yr/yr | -0- | 0.05/yr/yr | -0- |
| Shallow Groundwater @ $15 x 3 x 50 | -0- | 2.25/yr | -0- |
| Subtotal | -0- | 4.75.yr<br>0.05/yr/yr | -0- |
| **Rental:** | | | |
| Office @ $300/mo x 12 | -0- | 3.60/yr | -0- |
| Office supplies, telephone, etc. | -0- | 2.00/yr | -0- |
| Van lease, gas & oil | -0- | 6.00/yr | -0- |
| Small motorboat - 4 wks/yr | -0- | 0.40/yr | -0- |
| Subtotal | -0- | 12.00/yr | -0- |
| **E&A Costs:** | | | |
| Contingencies - 9% of 1980 costs | 170.5 | -0- | -0- |
| Site Analysis | 431.3 | -0- | -0- |
| Cluster System Design* | 70.0 | -0- | -0- |
| | 671.8 | -0- | -0- |
| Total - As of 1980 | 2565.9 | 105.4/yr | 396.3 |
| - Increment 1980 - 2000 | 104.5/yr | 1.27/yr/yr | 310.1 |

($ x 1,000)

## Present Worth

Present Worth Cost = 2565.9 - 10.9099 (209.0) - 81.155 (1.27)
= 4763.1 - 0.2772 (706.4)

## Assumptions

| | | |
|---|---|---|
| Number of Units | 1,134 | Residences |
| | 30 | Resorts |
| | 17 | Businesses |
| | 1,181 | Total |

---

* Assuming that several (~ 5) are designed at the same time.

|  |  |
|---|---|
| Federal Funding | 85% of cost of site analysis & capital cost of replacement systems |
| State Funding | 9% of above cost |
| Debt Retirement | 30 year loan @ 6 7/8%<br>1980 capital costs only<br>20% debt reserve |

User Charges (as of 1980)

|  |  |
|---|---|
| Debt Retirement - 0.07958 (6%) ($2,565,900) | ($) |
| Debt Reserve - 20% (11,917) | 12,252 |
| Annual O&M | 2,450 |
| Total annual local cost | 105,400 |
|  | $120,102 |

User charge = Total annual local cost/number of units
= $102,102 ÷ 1,181 = $102

## Modified Limited Action Site Analysis and Costs

### Description of Work To Be Done

The first step in adopting the Modified Limited Action Alternative will be a site analysis of existing wastewater disposal units and wells in the Study Area. This site analysis will consist of a sanitary survey, sampling and metering of wells, soil sampling, inspection and excavation of on-site systems, and shallow groundwater sampling near lake shores.

A survey team will conduct a sanitary survey of each home, resort, and business in the Study Area. The team will ask residents to complete a questionnaire regarding their wastewater systems and wells, will inspect wastewater systems sites and wells, and will take samples of well water from all homes or businesses surveyed. The well samples will be analyzed for fecal coliform bacteria and for nitrates and the results of the survey will be used to plan work to be done for the remainder of the site analysis.

When the survey has been completed, septic tanks reported or likely to be undersized will be inspected. The inspection team will locate tanks to be inspected, will uncover and pump them, and will inspect them for construction, size, leaks condition, and types of sanitary tees and baffles. The team will also rod influent lines (noting roots, other obstructions, and collapsed pipe) and effluent lines (noting these items plus distances to headers, distribution boxes, bends, and obstructions).

Next, soil samples will be taken for lots with a) past and present sewage system malfunctions not explained by the sanitary survey or septic tank inspections, b) substandard soil disposal units and c) soil disposal units for which there are no records. The samples will be examined to determine soil texture and color, depth to the seasonal high groundwater level, and water table depths at suspected areas of soil disposal units and at alternative disposal sites on or near the lots. The soil sampling team also will probe the suspected part of the soil disposal unit for depth, size, and type.

After soil samples have been taken, a team of laborers will inspect subsurface disposal units of those on-site systems having recurrent backups or past surface malfunctions not explained in prior steps. The team will hand excavate effluent lines, will hand excavate test pits (to examine size, depth, and type of soil disposal unit), and will evaluate soil hydraulics (soil crusting, decomposition and silting in of aggregate, soil distribution) as reasons for on-site system failures.

Then well water meters will be installed to monitor flows to those on-site systems with limited hydraulic capacity as determined by the sanitary survey, soil sampling, and excavation of the soil disposal unit.

Finally, the impact of wastewater disposal on lake water will be investigated by examining shoreline groundwater. The direction of groundwater flow along lake shores will be determined at ½ mile intervals four times over a one year period. Also, emergent plumes from on-site systems will be detected by scanning the lake shore with a fluorescent meter; sites having plumes will be further analyzed using a shoreline transect and 5 samples per plume (to be analyzed for bacteria and nutrient levels).

The results of the site analyses described above will be used to identify specific measures that can be taken to correct malfunctioning on-site systems and polluted wells in the Study Area.

Assumptions

| | | |
|---|---|---|
| Numbers of Systems | 1,134 | Residences (30% permanent, 70% seasonal) |
| | 63 | Resort (3 EDU/system, 14% permanent, 86% seasonal) |
| | 17 | Businesses (24% permanent, 76% seasonal) |
| | 1,214 | |
| Number of Problems | 25 | ST/SAS's with limited hydraulic capacity |
| | 806 | ST/SAS's which may have undersized tanks* |
| | 176 | Cesspools |
| | 73 | Holding tanks |
| | 27 | Holding tanks or inadequate soil absorption systems in 13 resorts |
| Step 1-- Sanitary Survey & well sampling | 284 | person-days (1,134 residences ÷ 4/person/day) |
| | 24 | person-days (47 businesses and resorts ÷ 2/person/day) |
| | 308 | person-days (Sanitarian 23, Sr. Engineer 23, surveyors 205, W.Q. Scientist 21) |

Additional Costs - well sample test @ $5/sample x 118

| | | |
|---|---|---|
| Step 2-- Septic tank inspection | 150 | person-days (900 systems ÷ 6/person/day) |
| | 150 | person-days (Jr. Engineer 150) |

Additional costs - 3-man crew @ $450/day x 150
- waste disposal @ $20/tank x 900

| | | |
|---|---|---|
| Step 3-- Soil sampling | 364 | person-days (60% x 1,214 systems ÷ 4/2 persons/day) |
| | 364 | person-days (soil scientist 189, surveyor 175) |
| Step 4-- Disposal unit inspection | 40 | person-days (13% x 938 systems ÷ 3/supervisor/day) |
| | 243 | person-days (13% x 938 systems ÷ ½ persons/day) |
| | 283 | person-days (Sanitarian 40, laborers 243) |
| Step 5-- Well water Meters | 44 | person-days (15% x 1,181 wells x 6 inspections ÷ 24 inspections/person/day) |
| | 44 | person-days (Surveyor 44) |

---

* Total number of systems minus number of septic systems (107) certified according to the County Office of Land & Water Resource permits minus number of other problem systems.

Additional costs - Meter installation @ $175/meter x 177

| | | |
|---|---|---|
| Step 6--<br>Shallow<br>Groundwater<br>Sampling | 20 | person-days (10 days x 2 persons for scan) |
| | 80 | person-days (80 plumes ÷ 2 plumes/day x 2 persons) |
| | 100 | person-days (Sanitarian 25, W.Q. Scientist 50, Surveyor 25) |

Additional cost - Nutrient analyses @ $15/series x 5/plumes x 80 plumes

| | | |
|---|---|---|
| Step 7--<br>Shore ground-water hydrology survey | 40 | person-days (5 days/survey x 2 persons x 4 surveys) |
| | 40 | person-days (Sanitarian 20, W.Q. Scientist 5, Surveyor 15) |
| Step 8--<br>Supervision, documentation, clerical | 260 | Work-days (Sanitarian @ 100% including above time, Sr. Engineer @ 25% + 20 days to prepare report, Secretary @ 100%) |

Labor Summary

Person-Days Per Step

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Total |
|---|---|---|---|---|---|---|---|---|---|
| Sanitarian | 23 | | | 40 | | 25 | 20 | 152 | 260 |
| Sr. Engineer | 23 | | | | | | | 62 | 85 |
| Jr. Engineer | 23 | 150 | | | | | | | 173 |
| Soil Scientist | 13 | | 189 | | | | | | 202 |
| W.Q. Scientist | 21 | | | | | 50 | 5 | | 76 |
| Surveyors | 205 | | 175 | | 44 | 24 | 15 | | 464 |
| Laborers | | | | 243 | | | | | 243 |
| Secretary | | | | | | | | 260 | 260 |
| | 308 | 150 | 364 | 283 | 44 | 100 | 40 | 474 | 1,763 |

OTCDLRM* Costs

| | | |
|---|---|---|
| Salaries | Sanitarian @ $25,000/yr x 260 days | $25,000 |
| | Surveyors @ $11,000/yr x 464 days | 19,630 |
| | Laborers @ $12,000/yr x 243 days | 11,215 |
| | Secretary @ $12,000/yr x 260 days | 12,000 |
| | Subtotal | 67,845 |
| | 20% fringe benefits | 13,569 |
| | Subtotal | 81,414 |
| Rent | Office @ $300/mo. x 12 months | $ 3,600 |

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* Otter Tail County Department of Land and Resource Management.

## OTCDLRM Costs--Continued

| | | |
|---|---|---|
| Service Contracts | Well sample analysis @ $5/sample x 1,181 | $ 5,905 |
| | Septic tank inspection - $450/day x 150 | 67,500 |
| | - $20/tank x 900 | 18,000 |
| | Well water meters @ $175/meter x 177 | 30,975 |
| | Plume sample analyses @ $15 x 5 x 80 | 6,000 |
| Equipment & Sampling | Fluorescent meter | $14,000 |
| | Groundwater flow meter | 4,000 |
| | Field sampling equipment | 2,000 |
| | Paper supplies | 2,000 |
| | Cameras & film for documentation | 3,000 |
| | 2 vans @ ($350/mo + $120 gas-oil/mo) x 12 | 11,280 |
| Summary | Salaries | $ 81,414 |
| | Rent | 3,600 |
| | Contracts | 128,380 |
| | Equipment & Supplies | 36,280 |
| | Total OTCDLRM | $249,674 |

## Consultant Costs

| | | |
|---|---|---|
| Direct Labor | Sr. Engineer @ $35,000/yr x 85 days | $11,440 |
| | Jr. Engineer @ $20,000/yr x 173 days | 13,310 |
| | Soil Scientist @ 25,000/yr x 202 days | 19,420 |
| | W.Q. Scientist @ 25,000/yr x 76 days | 7,310 |
| | | $51,480 |
| Other Direct Costs | Report & Reproduction | 150 |
| | Communication | 1,000 |
| | Graphics, report preparation | 1,500 |
| | | $2,650 |
| Travel | House rental for office, sleeping x 12 mo's | 6,000 |
| | Other per diem @ $20/day x 536* | 10,720 |
| | 65 RT x 250 miles x $0.20/mile | 3,250 |
| | | $19,970 |
| Summary | Direct labor x 3.0 | 154,440 |
| | Other direct costs x 1.2 | 3,180 |
| | Travel x 1.2 | 23,964 |
| | Total consultant | $181,584 |

## Total Costs

| | | |
|---|---|---|
| OTCDLRM | | $249,674 |
| Consultant | | 181,584 |
| | Total | $431,258 |

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* Assuming that the consultants work 5 days/week.

# APPENDIX E

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# APPENDIX F

# DELETIONS FROM THE DRAFT EIS

## APPENDIX F

# DELETIONS FROM THE DRAFT EIS

Preparation of this Final EIS entailed deletion of material from the Draft and, in most instances, replacement with new wording. Some of the deletions were necessitated to reflect the 1981 amendments to the Clean Water Act and new regulations implementing the Act. However, such deleted sections still apply to grants made before May 12, 1982, the effective date of the new regulations. This appendix makes deleted material available for ready cross-referencing.

Some material was deleted or replaced due to refinement in Region V's policies on a few subjects. These deletions are also included here.

After each deletion, a short note explains the reason for the change.

Deletions are presented here in the order in which they appeared in the Draft EIS. Section and page numbers preceding each deletion identify their location in the Draft EIS.

# EXECUTIVE SUMMARY DELETIONS

From "Small Waste Flows Technologies," p. iv:

Preliminary delineation of sewered and unsewered service areas may be possible.

The second stage is based on system selection. Partial sanitary surveys and representative sampling of soil and groundwater provide the basis for more conclusive identification and quantification of on-site system failures. The results are extrapolated to unsurveyed on-site systems and appropriate systems (including no action), are tentatively selected for each developed property in unsewered service areas. This will normally be adequate for cost-effectiveness comparisons with centralized alternatives and for description of facilities plans' proposed action.

The final stage of development for optimum operation alternatives will normally be completed with a Step 2 or Step 2 and 3 grant because of the time and expense required for detailed site analysis. Also, because eligibility of off-site treatment facilities may be dependent on the detailed site analysis and subsequent micro-scale cost-effectiveness analysis, final site suitability studies and site selection may be delayed beyond Step 1. The final stage, facilities verification, is based on a detailed site analysis. The analysis includes completion of the sanitary survey and, where needed, on-site work to determine causes of failure and appropriate remedies. To avoid repeated inspection of systems and owner annoyance this step may commonly be followed (in Step 2 and 3 projects) by the actual construction needed.

Note: The replacement for these paragraphs allows greater flexibility in the amount of field work required to describe optimum operation alternatives.

From "Community Management," p. v:

- certifying that a public body will be responsible for the proper installation, operation, and maintenance of the funded systems;
- establishing a comprehensive program for regulation and inspection of on-site systems that will include periodic testing of existing potable water wells and, where a substantial number of on-site systems exists, more extensive monitoring of aquifers; and
- obtaining assurance of unlimited access to each individual system at all reasonable times for inspection, monitoring, construction, maintenance, operation, rehabilitation, and replacement.

Note: The wording of these items was changed to follow the May 1982 regulations more closely.

From "Facilities Planning Techniques", p. viii:

Facilities planning can be a frustrating and time-consuming process for grantees. Changes in grants program emphasis, as reflected in this EIS, procedural changes and funding modifications contribute to the delays and revisions sometimes encountered. The conclusions and recommendations this EIS presents will, hopefully, lead to well designed, efficient facilities planning exercises. Other specific suggestions are made for abbreviating the processes of needs documentation and development, costing, selection, and design of alternatives.

Note: This paragraph was deleted based on the editorial opinion that it added little useful information to the Executive Summary

From "Funding and Administering the Optimum Operation Alternative," p ix:

Recent analysis of the opportunities and problems associated with small waste flow management has led to numerous clarifications of the requirements of the Clean Water Act and its regulation. Most of these are summarized in Facilities Planning 1981, the Program Requirements Memoranda that contributed to it, and other U.S. EPA and Regional Guidance. Among the most important items reviewed are:

> Note: The replacement for this material recognizes the presence of new legislative and regulatory documents.

From "Funding and Administering the Optimum Operation Alternative," p x:

- Needs Documentation for Alternative Sewers--While alternative sewers are excepted from the various requirements specified in PRM 78-9, they are not exempt from the general requirements for demonstrated need that rest upon every fundable action. Future guidance will emphasize this.

> Note: The PRM that was the source of this issue has been replaced with suitable guidance. The item is deleted without replacement.

From "Funding and Administering the Optimum Operation Alternative," p. x:

- Pilot Studies--Program Operations Memorandum 81-3, issued during preparation of this EIS, authorizes pilot studies of innovative and alternative technologies under Step 1 facilities planning.

> Note: The wording and content of this item have been changed to recognize amendments to the Clean Water Act that make field testing of alternative and innovative technologies eligible for Step 3 funding.

## CHAPTER I DELETIONS

From Section A, p. 4:

Throughout this document, cross-reference notes are printed in margins. These notes refer either to related sections within the document or to sections of the separate Technical Reference Document. The Technical Reference Document comprises over 70 new individual technical and analytical reports. The recommendations of this EIS come from the experience and data gained on the seven case studies and the Technical Reference Document.

> Note: This paragraph has been omitted in favor of a more specific legend repeated on the first page of each chapter.

From Section B, p. 4:

These objectives are consistent with present regulations implementing the Clean Water Act, especially 40 CFR 35.917-1, which states in part:

> Facilities planning must address each of the following to the extent considered appropriate by the Regional Administrator: . . . (d) A cost-effectiveness analysis for the treatment works . . . This analysis shall include: . . . (3) An evaluation of improved effluent quality attainable by upgrading the operation and maintenance and efficiency of existing facilities as an alternative or supplement to construction of new facilities.
>
> Note: This paragraph was replaced with language from new regulations.

From Section C.2., pp. 10 and 12:

New centralized facilities are capital intensive. Even with substantial Federal and state grant assistance, municipalities can have difficulty financing the local share of construction costs. All local costs are ultimately passed on to users of the system and possibily to taxpayers who are not even users. Annual user charges exceeding $200 are not uncommon for new conventional facilities in small communities. Within Region V, annual residential user charges rarely exceed $200--only 10 out of 687 user charge systems approved as of September 1980 were greater (U.S. EPA, 1980a). However, all 10 of these communities and 14 of 17 communities charging $150-$200 per year have populations of 10,000 or less. [Only communities that are building collection sewers and interceptors in the Region are included in this analysis. The user charges do not include private costs for plumbing charges or house sewer construction (often $1,000 or more) and most user charges have already been minimized to varying degrees by initial hook-up fees (often $2,000 or more)].

> Note: This paragraph was revised to reflect the fact that capital costs can be and often are, recovered separately from O & M costs and that user charge systems are required only to recover O & M costs.

# CHAPTER II DELETIONS

From Section A.4, pp. 26 and 30:

The decision flow diagram reflects no judgments regarding eligiblity of specific items or their appropriate timing in the 3-step Construction Grants process. Generally, "actions to take" will be eligible if adequate justification is provided. A subsequent process diagram (Figure II-C-2) relates the procedures in the decision flow diagram to the requirements of the Construction Grants process, necessary management structures, and needs documentation guidance. Timing is disucssed in Sections II.D.E. and G.

> Note: Due to changes in funding of Steps 1 and 2, emphasis on timing and eligibility of items in the decision flow diagram is not critical to projects beginning after May 12, 1982. Figure II-C-2 and this paragraph referring to it have, therefore, been modified in the Final EIS.

From Section C.2., p. 36:

The accompanying decision flow chart (II-C-2) shows the combined needs documentation and alternatives development procedures associated with construction of an optimum operation alternative under the Clean Water Act. The remainder of this chapter is a step-by-step discussion of the procedures outlined in this chart, from collection of existing data through actual construction....However, when followed in the sequence shown on the process diagram, these methods minimize wasted time, effort and effort and expense in needs documentation and alternative development regardless of project potential for Federal funding.

> Note: See note above.

From Section D, p. 38:

- To produce a tentative system selection for every site at the conclusion of Step 1. Even without Construction Grants funding, this early estimate can greatly reduce public uncertainty about an optimum operation alternative.

  Note: This Draft EIS recommendation has been changed to allow more flexibility in describing optimum operation alternatives in facilities plans.

From Section D.1.c., p. 44:

Many of these "false negatives" can be minimized through careful use of the equipment. The device should not be used during high winds. Monitoring of groundwater flow patterns through use of a meter or other methods can clarify groundwater factors. Information on changes in lake level and recent rainfall or snow melt is also important.

> Note: An expanded discussion of supporting data collection for septic leachate surveys replaces this paragraph.

From Section D.1.d., p. 45:

Since the facilities planner wants to minimize intrusion on private property and reduce the number of visits to any particular site, the mailed questionnaire should be sent only to areas where available date indicate a significant number of on-site system problems and where preliminary economic analysis indicates that sewering will be cost-effective. Use of mailed questionnaires is discouraged where optimum operation alternatives may be cost-effective since on-site sanitary inspection would be required.

Note: This cautionary recommendations has been deleted. Facilities planners should use this judgement on the utility of any measure that intrudes on privacy.

From Section D.2.a., p. 46:

Sanitary surveys need to include only enough on-site sanitary inspections to meet these two objectives. In general, not more than 30% of all developed properties in a community should be inspected in Step 1. Higher or lower coverage may be appropriate for individual segments depending on the quality of data available prior to design of the survey.

Note: This quantitative restriction has been removed to allow facilities planners more flexibility.

From Section D.2.a., p. 46:

Because statistical accuracy is not critical, targeted surveys may cover as few as 10% of developed properties in a segment or community. Up to 50% of those residences having obvious problems may be inspected in Step 1.

Note: See note above.

From Section D.2.a., p. 46:

Causal relationships may be used in conjunction with other local data to expand survey results to unsurveyed systems.

Note: Based on surveys conducted by Region V since publication of the Draft EIS, we feel that selection of specific technologies, no matter how tentative, for individual properties without at least an on-site sanitary inspection would be unnecessarily misleading and could cause property owners to plan on actions that may change or not be taken at all.

From Section E.2.a., p. 51

After the partial sanitary survey and representative sampling it should be possible to (1) understand the nature and cause of specific on-site system problems, and (2) generalize from sampled system to unsampled systems with similar characteristics.

In this task even indirect evidence can play a part. A specific system parameter (lot size, separation distance from well, etc.) requires no action by itself; if, however, the Phase II data collection shows that parameter to be closely correlated with one or another kind of failure, it may be used to tentatively select facilities for a similar site not surveyed.

The aim of system selection is to allow a tentative recommendation for each dwelling based on at least some on-site data (even if indirect evidence).

Selections are contingent on detailed site analysis in Construction Grants, Steps 2 or 3.

Note: See note above.

From Section E.2.c., p. 52:

- Management Program Outline. Construction Grants regulations require a comprehensive program for regulation and inspection of small waste flows systems. A plan for this program must be submitted as part of a facilities plan (40 CFR 35.918-1(i)). While some specifics may change after detailed site analysis and facilities verification, most of the decisions can be made once an optimum operation alternative is selected. The plan should describe how the applicant will guarantee access to on-site systems. Chapter III discusses management programs in detail.

  Note: This material has been changed to incorporate language from new regulations.

From Section E.3., p. 52:

Phases I and II are intended to identify cost-effective solutions at the community and segment levels. The next accomplishment is verification for individual systems of the technology choices made during facilities planning. This is called "facilities verification." It includes the selection of type, location and significant design parameters for all on- and off-site facilities required for an optimum operation alternative.

To accomplish this, the sanitary survey of developed properties must be completed. For properties having direct discharges, documented failures (surface malfunction, recurrent backups, or groundwater contamination) or potential problems (because of unacceptable design or similarity with failed systems), detailed site analysis is also required. As suggested in Figure II-A-1, the work performed in the detailed site analysis depends on the type of problem indicated.

Given the complete data base generated to this point, the final level of cost analysis needed to select particular facilities for buildings or groups of buildings is possible. Where on-site facilities will be adequate, little cost analysis will be required. For marginal on-site systems where the risk of poor performance is expected to be high, more intensive cost analysis may be indicated which weighs administrative, monitoring and replacement costs against cost savings resulting from staying with high risk facilities. In situations where the choice is between a low percentage of high cost on-site facilities for a group of buildings and an off-site system for all the buildings, appropriate cost analysis would also be indicated.

In practice, most on-site facilities can be verified in the field at the conclusion of the detailed site analysis. The site or neighborhood cost-effectiveness analysis step provides a retrospective on the individual decisions made in the field and permits consideration from the entire community's perspective of potential economies in management services and facilities costs.

Design of off-site facilities likely will require additional site work. The need for this effort will optimally have been forseen and the work will have been initiated early in Step 2 and, in particularly obvious cases, in Step 1. However, decisions to go off-site may well depend on completion of the detailed site analysis, the neighborhood cost-effectiveness analysis and, possibly, management program design decisions.

Note: This material was rewritten to be more readable.

From Section G, pp. 63-64:

## G. SHORTCUTTING THE CONSTRUCTION GRANTS PROCESS

In order to be eligible for U.S. EPA Construction Grant funds, rural communities must demonstrate a need for wastewater treatment improvements in compliance with Federal guidance such as PRM 78-9 and PRM 79-8. To clarify these requirements, U.S. EPA Region V has prepared "Region V Guidance--Site Specific Needs Determination and Alternative Planning for Unsewered Areas" (Region V Guidance) (Appendix A). To be useful in as many planning areas as possible, the Region V Guidance assumes a "worst case" situation. Four assumptions implicit in the Region V Guidance that make it widely applicable are:

1. Very little data exist prior to Step 1 that reliably define the design, usage, and performance of existing on-site systems.

2. Service areas cannot readily be delineated for centralized collection and treatment, community supervision of small waste flows facilities, or no action.

3. The severity of existing and potential problems with on-site systems justifies active community management of all or a significant fraction of the systems.

4. Technologies to replace and upgrade existing on-site systems will include substantial use of off-site, innovative, and/or subcode designs thereby necessitating delays in facilities verification until all individual developed sites are thorougly surveyed and analyzed.

When communities are not affected by some of the above assumptions, the needs documentation and subsequent Construction Grants procedures may be shortened. For example, if sufficient data on design, usage, and performance of existing on-site systems exist, preliminary data gathering (Phase I) can be shortened accordingly. Subsequent data gathering (Phase II) can then be targeted to specific areas resulting in less work than would be required if no preliminary data were available.

Based on available data, complexity of service area delineations, and severity of on-site problems, individual communities can tailor needs documentation, alternative development, costing, and selection to suit their specific situations. Examples of such modifications and suggestions for abbreviating the process are listed below:

- Perform data collection at the proper time of the year to avoid having to return to the field (for example, sanitary surveys when seasonal residents are available).
- Collect data early or on an on-going basis for existing systems, failures, etc.
- Avoid duplication of effort by limiting the number of return visits to individual sites.
- Separate areas requiring centralized treatment from the remaining areas to expedite the facilities planning process.
- Use standard on-site system designs when appropriate.
- Acquaint local officials with the Construction Grants process.
- Use milestones (preapplication conference, plan of study, mid-course meeting, and final facilities plan) for decision-making and adjusting the scope of facilities planning as necessary.
- Enact county ordinances and/or state enabling legislation to provide access to private systems.
- Perform detailed site analysis during facilities planning during Phase II needs documentation work.
- Verify facilitities, design non-standard on-site systems, and construct on-site systems with a Step 2 and 3 Grant.

Note: Means of flexibly applying the "Region V Guidance" are thoroughly covered in Technical Reference Document XVI-D which is now appended with the Guidance in Appendix A. Other recommendations in this section were covered elsewhere in the EIS. Therefore, this section was replaced with a discussion of the community role in needs documentations, facilities planning and detailed site analysis.

## CHAPTER III DELETIONS

From Section F., p. 77:

...35.918-1(h) that communities seeking funds for individual systems must "obtain assurance (such as an easement or covenant running with the land), before Step 2 grant award, of unlimited access to each individual system at all reasonable times for such purposes as inspection, monitoring, construction, maintenance, operation, rehabilitation, and replacement." PRM 79-8 also applies this to publicly owned on-site treatment systems, or their equivalent.

> Note: The text has been revised to contain wording from new regulations. This wording is still in effect for grants approved before May 12, 1982.

From Section H.1.a., p. 80:

Requirements for monitoring potable water wells are stated in 40 CFR 35.918-1(i) and PRM 79-8. PRM 79-8 states that a comprehensive program for regulation and inspection of Federally funded publicly and privately owned small waste flows systems shall also include, at a minimum, testing of selected existing potable water wells on an annual basis.

This policy allows the selection of wells tested each year on a case-by-case basis.

> Note: Requirements for monitoring potable water wells do not appear in the new regulations. This requirement is still in effect, however, for grants issued before May 12, 1982.

From Section I.1., p. 82:

U.S. EPA PRM 76-3 requires that the facilities plan include the estimated monthly charge for operation and maintenance, the estimated monthly debt service charge, the estimated connection charge, and the total monthly charge to a typical residential customer. The stated purpose for this is to encourage the consideration of least costly alternatives and the possible use of public and private facilities. A user charge system must be developed by the community and approved by U.S. EPA during Step 3, at the latest, of the Construction Grants Program.

> Note: The text has been revised to contain wording from new regulations. This wording is still in effect for grants approved before May 12, 1982.

From Section I.1., p. 82:

For optimum operation alternatives, proportionate use can be measured by type of user (for example, residential), duration of use (seasonal, permanent), flow, or type of technology. Users may also be billed directly for specific services provided by the management agency.

> Note: The validity of this statement has been questioned. The section has been revised to discuss the possibility of assessing costs according to type of technology or specific services provided. However, it is made clear that current regulations do not explicitly allow such basis for cost recovery.

From Section I, pp. 82-84:

2. USER CHARGE STRUCTURES

The local public costs can be allocated by user charges in a variety of ways at the discretion of the local government. Three major ways of allocating local public costs are averaging the costs among all users in the project's service area, establishing user groups, (that is, charging on the basis of criteria such as flow, technology used, or location), and charging each user the specific costs of facilities and services provided by the community individual user/specific cost method. The method of allocating costs chosen by the community may be based on considerations such as the costs of implementing the user charge system, the number and locations of residents benefitting from the project, the extent to which a mix of technologies is used, and the consideration of equity and efficiency.

The cost of implementing the user charge system may be high yet still politically feasible if all users are charged by the community for the specific costs they impose on the community. A sophisticated bookkeeping system would be required to allocate specific capital, operation and maintenance, and reserve funds for each user; such a system may exceed the administrative capacity of the local government. Averaging all costs among all users would be the least expensive and time-consuming method of allocating costs. A system based on user groups would probably be intermediate in cost.

## 3. BASIS FOR SELECTION

The beneficiaries of the project are the initial consideration in the design of a user charge system. In addition to owners receiving direct assistance in the improvement, replacement or operation of their on-site systems, beneficiaries may include:

- residents and non-residents who use the water resources being protected,
- where off-site facilities are constructed, land owners who could not previously build but are thus enabled to,
- businessmen whose revenues depend on the attractiveness of the water resources being protected, and
- property owners who do not require assistance at present but for whom the availability of assistance is a benefit,
- property owners who would otherwise be required to pay the price of sewers but who can retain properly operating on-site systems under an optimum operation alternative.

If such benefits are well distributed among users, the case for averaging all local costs is good. However, the range of technologies that may be used, the often localized or spotty problems for which improvements are necessary, and the possibility of use restrictions can be expected to present a more complex benefit distribution. A useful exercise for grantees, once the water quality problems are defined and appropriate technologies selected, would be to identify classes of beneficiaries.

Allocating costs to classes of users is most reasonable when a mix of technologies is used. Costs may vary significantly according to the type of technology used. Users with low-cost systems might be reluctant to subsidize users with high-cost technologies. Charging by user class requires the community to spend more time and effort for bookkeeping than it would to average costs among all users. However, the user group method would be less difficult and expensive than the individual user/specific cost method.

The final consideration in choosing a way to allocate costs involves the issues of equity and efficency. Equity in this case refers to charging users in proportion to the costs they impose on the management system. For the optimum operation alternative, the most equitable user charge system is the individual user/specific cost method. For instance, residents with conventional septic tank/soil absorption systems on large, well-drained lots would have very low costs. They may be charged only for septic tank pumping and drainfield inspection once every three years. Residents with dosed systems or residents served by cluster systems may have to pay larger charges and more frequently. Residents using holding tanks could have routine and quite substantial costs.

## 4. CONSEQUENCES AND TRADE-OFFS

User charge systems can affect the efficiency of the wastewater management system. Charges that encourage users to abuse their wastewater facilities are inefficient. Charges that promote efficiency, however, may not be equitable. Consider owners of holding tanks: if they have to pay the full cost of pumping their wastes, they may occasionally dispose of the wastes themselves in a manner hazardous to themselves or their neighbors. However, it is not equitable for the management agency to provide free pumping service for them and to average the cost to all other users. Clearly in this case, equity and efficiency in a user charge must be balanced. Charging substantial fees for water use that will not economically threaten the holding tank owners may encourage vigorous conservation and may prevent owners from endangering others with unsanitary practices. A partial subsidy may otherwise benefit the community by making holding tanks a feasible option so that everyone does not have to contribute to buying a sewer.

> Note: These subsections have been deleted in their entirely due to their reliance on the unfounded assumption that regulations allow O & M costs to be allocated to users on the basis of type of technology or on actual services provided. A new subsection 2 titled "Cost Recovery Options" discusses this basis for O & M cost allocation but explicity states that current regulations do not consider its use in Federally funded projects.

# CHAPTER IV DELETIONS

From Section A.1., p. 89:

Current Construction Grants Program guidelines (40 CFR 35.917-2 and 35.917-4) indicate the responsibility for delineating facilities planning area boundaries. The guidelines require that each state shall work with local governments in defining and mapping facilities planning area boundaries. Planning areas will be large enough to take advantage of economies of scale where individual systems are likely to be cost-effective. If the state does not delineate the boundaries, the U.S. EPA Regional Administrator may make the delineation or revise the boundaries in cooperation with state or local officials.

> Note: Wording from the new guidance document, Construction Grants - 1982, has been substituted for this paragraph.

From Section B.4., p. 97:

According to the cost-effectiveness guidelines (40 CFR 35.9, Appendix A), applicants may perform their own population projections as long as their figures correspond to recent trends in the local area. These projections could contain, for example, information on recent building permit activity and/or an analysis of the land holding capacity based on local codes and ordinances. If these projections are performed based on locally derived data, considerable unneeded expense may be avoided and environmental impact may be mitigated by facilities planning.

> Note: The regulations cited continue to apply to projects receiving grants before May 12, 1982, but they have no parallel provisions in new regulations and guidance.

From Section D.1., p. 102:

Inspection and sampling of all drinking water wells may be eligible in unsewered areas only after the decision has been made to pursue the optimum operation approach. Exceptions can be made so that all or most wells may be sampled before this decision if the data are shown to be necessary to make the decision. In sampling all wells, provision should be made for repeat sampling of those that were positive.

> Note: Eligibility of specific facilities planning steps is no longer an issue under the allowances now available for facilities planning.

From Section D.2., p. 102:

Submittal of this graph showing the position of local lakes will assist in application for Construction Grants funds to collect and analyze water samples in support of detailed nutrient modeling. As a rule of thumb, lakes that fall below 1.0 (symbol) of phosphorus will probably not be eligible for sample collection and analysis. Between 1.0 and 10.0 (symbol), applicants may first propose to construct nutrient budgets based on empirical models and available data, then collect confirmatory data appropriate to the major uncertainties in the nutrient budget. Above 10 (symbol), applicants may propose to construct nutrient budgets based on empirical models and available data. The need for confirmatory sampling will be evaluated on a case-by-case basis.

> Note: See note above.

# CHAPTER V DELETIONS

From Section A.1.a., pp. 112-113:

Fortunately, the existing text of the Clean Water Act and regulations offered a reasonable solution to this problem: public ownership of single-family on-site systems. 40 CFR 35.918-1 requires that applicants for individual system funding "(d) certify that public ownership is not feasible, and (h) obtain assurance (such as an easement or covenant running with the land)...of unlimited access to each individual system at all reasonable times for such purposes as inspection, monitoring, construction, maintenance, operation, rehabilitation and replacement." PRM 79-8 specifically relates these two requirements, stating that access and control by an agreement running with the land are "tantamount" to public ownership. The July 16, 1980 memorandum from William A. Whittington, Acting Facilities Requirements Division Director, extended this equivalence to public ownership to access by local or county ordinance (see below).

Note: This material has been revised to be applicable to current policy decisions.

From Section A.3.a., p. 114:

As described above, 40 CFR 35.918(h) requires access and control at reasonable times (by means of an easement or covenant running with the land) for Federal funding of all individual systems. PRM 79-8 extends this to "publicly owned" single-family systems occupied by seasonal residents.

Note: This has been revised to use language from new regulations.

From A.3.b., p. 115:

## b. Needs Documentation for Alternative Sewers

The advantages of pressure, vacuum, and small diameter sewers over gravity sewers are largely associated with cost-effectiveness. These include the virtual elimination of infiltration and inflow, and much lower costs for unusual site conditions. Since they can be built in environmentally sensitive areas that are difficult or impossible to sewer conventionally, some alternative sewers can induce growth on sites otherwise undevelopable. Except for cost-effectiveness and feasability of treatment for problem areas, there is no special national interest in preferentially subsidizing alternative sewers.

Program Requirements Memorandum 78-9 established definite standards for eligibility of collector sewers. Among these were the "two-thirds" rule, the requirement for substantial human habitation of the areas served by a prescribed date, and a definition of needs documentation that extended only to actual violation of water quality standards or an identified immediate public health hazard. A later PRM (79-8) specifically exempted alternative sewers from the entire policy set forth in PRM 78-9.

This exemption has sometimes been misunderstood as to exempt alternative sewers from any kind of needs documentation at all. This is clearly a misunderstanding, since not only the regulation but the text of the Clean Water Act itself specifically requires documentation of need for every action. Future U.S. EPA and regional guidance will make it clear that alternative sewers are exempt only from the two-thirds and substantial human habitation rules applicable to collector sewers.

Please note, however, that there are needs that may satisfy the general needs requirement of the text of the Clean Water Act and its regulations and still not satisfy PRM 78-9. Certain algal blooms associated with discharge of septic tank effluent through groundwater to a lake may seriously affect swimmability and fishability without violation of a specific water quality standard or an immediate public health hazard. Grossly inadequate treatment systems (55-gallon drums, buried automobiles, etc.) may not be causing a public health hazard, but have such an overwhelming probability of causing one as to constitute an identifiable need.

> Note: This section has been deleted and not replaced. New regulations covering the eligibility of collector sewer do not contain the ambiguity that created this issue.

From Section A.3.c., p. 115:

Program Operations Memorandum (POM) 81-3 has indicated that pilot plant work for innovative or alternative projects may be eligible for Step 1 facilities planning funds. The POM does state that funding of such studies during the Step 1 phase does not imply U.S. EPA policy or commitment to fund these studies during the Step 2 or Step 3 processes. Where long-term studies are desirable, additional sources of funding may be required.

> Note: The new discussion of pilot studies and field testing that replaces this material is based on new legislation and regulations.

## CHAPTER VI DELETIONS

From Section A.2.b., p. 129:

Eligibility of surface water sampling programs to develop nutrient budgets will be considered on a case-by-case basis but not until modeling excercises that can be completed without field data are prepared and submitted for review.

Note: Eligibility of specific facilities planning tasks is not a consideration for projects started after May 12, 1982. This limitations still applies, however, to earlier grant-funded projects.